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(12) **EUROPEAN PATENT APPLICATION**

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(54) **Method and apparatus for finding and selecting a desired data item from a large schedule of data items using a TV set and a controller similar to a TV-remote-control**

(57) An apparatus and method for presenting a viewer with an overall representation of the present number of entertainment programs available for selection given one week of program schedule data for 300 or more channels and one or more filtering criteria to limit the number of items represented in the overall representation. Sequentially applied filters will filter the group of program schedule data items that has at least 100,000 half hour time slots offered by 300 channels each week into a smaller subgroup where individual

consideration of each item of the subgroup can be made in a reasonable time. A set top box drives the display of overall representations or results of filtering criteria on a commercial TV set. Once a reasonable sized subgroup is obtained, other displays provide specific information of the program offerings of the subgroup. Selection of the filtering criteria and selection from within a subgroup is interactively made by a viewer through the use of a controller that looks and operates very much like a TV remote control. This makes the interaction familiar, easy and predictable.

EP 0 735 749 A2

Description**Technical Field**

5 The invention concerns a method and apparatus for subjecting a large schedule of data items having multiple attributes to consecutive selection criteria in order to reduce the number of individual programs to a manageable group which can be visually searched for a desired data item having a selected subset of the attributes, and more particularly to an apparatus and method which use an interactive control having directional buttons and a select button that are used in conjunction with an interactive display viewed on a normal television set to select the desired data item.

Description of the Prior Art

Presently there are known methods for reducing a large quantity of data into a manageable set of data which can be visually searched for a desired item by a decision maker. One example of such a large quantity of data is a directory of a fixed drive of a computer system. Methods implemented through interactive graphical user interfaces for personal computers and workstations display and reduce disk drive directories to root directory displays which typically show root level files and one or more branch subdirectories for the user's selection. Upon selection of a subdirectory, usually by a mouse, the display typically shifts showing files of the selected subdirectory and sub-subdirectories for further selection. The subdirectory display is often too big to fit on the screen, so interactive scroll bars are typically provided so the display may be controlled by a mouse. Using the mouse and the scroll bars, a user may work down the directory tree structure until the desired file is found. Such graphical user interfaces are common for computers and monitors where visual definition is typically at least 640 x 450 pixels for each display. Such techniques might be used in homes to access databases of useful information, such as airline schedules, television programming schedules and movie-on-demand catalogues. Unfortunately, each home does not have a computer or work station with 640x450 pixel definition which could take advantage of such existing databases. Further, the NTSC television set which almost every home has in its living room has relatively low viewing definition compared to 640 x 450 pixels or more per screen definition of computer monitors. Moreover, the typical home television set is not connected to a mouse, which is not an appropriate pointing device for the living room, rather most television sets have controls on control panels and/or on a remote controls. If just a fraction of these home television sets were used to find and select airline ticket reservations, programs to watch on 300 hundred or more channel cable television services, or pay-per-view movies from a vast collection, the profitability of the service providers and the satisfaction of the users would both be improved. The 300 plus channels mentioned, may use any type of transmission scheme that will deliver information via a cable or wireless path and includes but is not limited to time division multiplexed channels, frequency division multiplexed channels and packet data multiplexed channels.

One known approach for the TV programming schedule is to display the presently showing programs along with the next subsequent programs for the next hour or so, on what is referred to as a preview channel. Because this is more information than can be legibly displayed on one television screen at once, the preview channel display often scrolls through all the channel offering for the present time and the near future. For a sixty channel system, one complete scrolling takes about three minutes. At such a rate, a one hundred channel cable service would take five minutes and the future three hundred plus channel cable services would take 15 minutes. Needless to say, three minutes is a long time, but acceptable because breaks between programs are about that long. Five and fifteen minutes time periods though represent a substantial portion of a 30 minute program and are simply too long to expect a TV viewer to wait. The alternatives of speeding up the scrolling rate or using smaller size letters for descriptions are not practical either because either of these actions reduces the ability of the viewer to read and understand the schedule. Thus, there is a need in the art for a method and apparatus that allows a viewer to quickly find and select a desired data item from a large schedule, in this case a TV program for viewing from a TV programming schedule for 300 plus channels over the ensuing hours or even days. There is a similar need for a method and apparatus, very similar to the TV program selector, for finding and selecting a movie to order from movies-on-demand, or an airline flight(s) for a trip. It would further be desirable to use a method similar to the TV program selector to find and select a file in storage assets accessible by the apparatus to be executed, updated or deleted as part of file maintenance.

It is an object of the present invention to provide a view of a large schedule of data items and interactive selections of subgroups of the large schedule of data items in order to arrive at a screen display with sufficiently small number of items and sufficiently legible descriptions of each item to provide a viewer with an opportunity to make a reasoned selection therefrom.

It is another object of this invention to provide a method for interactively selecting a data item from a large schedule of data items by means of sequentially applying different filtering criteria using an interactive control having an operation appropriate for use with a television set.

Summary of the Invention

In another aspect of the invention, the aforementioned objects may be achieved by providing a method for a home television viewer to interactively select a data item from a large schedule of data item having multiple attributes. The method includes a step of receiving the large schedule of data items. The received schedule of data items is stored locally in a database format in order to expedite later filtering and retrieval. Next, the schedule of data items is filtered into a subgroup of the schedule of data items according to attributes selected by to interactive viewer inputs. The resulting subgroup of the schedule data items is displayed for the viewer's inspection. The user then interactively selects a data item from the subgroup of data items viewed on a television screen.

Briefly stated, in accordance with one aspect of the invention, the aforementioned objects are achieved by providing an apparatus for selecting an item from a large group in a system having display means and interactive movable pointing means for specifying a location in the display means and making a selection at a specified location. This apparatus includes a filtration means including subgroup specifiers in the display means and is responsive to selection of a subgroup specifier by the pointing means for filtering the list to produce the subgroup specified by the selected subgroup specifier; means for displaying representations of group items belonging to at least a portion of the subgroup in the display means; and group item selection means for selecting a group item by selecting the representation thereof in the display in response to the pointing means.

In yet another aspect of the invention, the aforementioned objects may be achieved by providing a method for a viewer to interactively select a program. The method includes a step of receiving program schedule data for at least 300 individual channels for a time period of at least a week. The received program schedule data is stored locally in a database format in order to expedite later sorting and retrieval. Next, the program schedule data is filtered into a subgroup of the program schedule data in response to interactive viewer inputs. The subgroup of the program schedule data is displayed for the viewer's inspection. The user then interactively selects a program from the subgroup of program schedule data for viewing on a TV screen, or alternatively for recording by an appropriate program recording device.

Brief Description of the Drawing

FIG. 1 is a pictorial of a television set connected through a set top box to a cable carrying the program to be selected and a controller for selecting that program.

FIG. 2 is a simplified block diagram of the set top box.

FIG. 3 is a pictorial of a controller as shown in FIG. 1.

FIG. 4 is a pictorial of a top most selection interactive display.

FIG. 5 is a pictorial of a second level selection interactive display.

FIG. 6 is a pictorial of a third level selection interactive display.

FIG. 7 is a pictorial of a first level selection query display.

FIG. 8 is a pictorial of a second level selection query display.

FIG. 9 is a pictorial of another third level selection query display.

FIG. 10 is a pictorial of a display showing a subgroup of programs meeting the Sports, All and On Now sorting criteria.

FIG. 11 is a pictorial of a of the display showing the subgroup of programs meeting the Sports, All and On Now sorting criteria along with a window having a preview of the highlighted program.

FIG. 12 is a pictorial of a display showing a second level selection interaction display, similar to FIG. 5.

FIG. 13 is a pictorial of a two-dimensional interactive grid display with very many program data items shown in reduced representations.

FIG. 14 is a pictorial of a third level selection query display, similar to FIG. 9.

FIG. 15 is a pictorial of a two-dimensional interactive grid display filtered down to a manageable number of data items.

FIG. 16 is a pictorial of a first alphanumeric interactive display.

FIG. 17 is the same display as FIG. 14 except that the highlighted interactive area is at a different location.

FIG. 18 is a pictorial of a second alphanumeric interactive display.

FIG. 19 is the same display as FIG. 16 except the highlighted interactive area is at a different location.

FIG. 20 is a pictorial of a third alphanumeric interactive display.

FIG. 21 is the same as FIG. 18 except that the highlighted interactive area is at a different location.

FIG. 22 is a pictorial of a fourth alphanumeric interactive display.

FIG. 23 is a pictorial of a two dimensional interactive display with logical third dimensional stacks for row and column intersections having multiple entries therein.

buttons 52-56 and double arrow buttons 60, 62 of controller 20. The file card menu 402 is surrounded by a frame 420, the top of which indicates the designation of the active area currently highlighted. Once an active area has been highlighted, a selection is made by actuating the **select** (✓) button 64 in FIG. 4, the TV button 410 is shown to be active: by actuating the **select** (✓) button 64, the next display 500 shown in FIG. 5 appears. This appearance is a logical overlaying of the display 500 over the display 400. Although display 400 is not visible while any logically overlaying display is appearing on the screen of the TV 10, display 400 will become visible again if all of the logically overlaying displays are canceled, i.e. by actuating the cancel (X) button 66. Thus, until a program is selected for real time viewing, it is possible for the viewer to work his or her way back to the display 400 by actuating the cancel (X) button the appropriate number of times.

FIG. 5 shows a second level display 500 which is depicted as a file card menu 502 labeled "TV", which appears to overlay and occlude all of file card menu 402 except for the label "Begin". The label TV indicates that the items that can be accessed are TV shows, such as dramatic series, situation comedies, serials, regular variety shows, game shows, sports, and so forth. Since movies and shopping were topics of other interactive buttons, these types of programs may be filtered out in whole or in part. File card menu 502 has interactive buttons labeled **On Now** 504, **Weekdays** 506, **Coming Up** 508, **Weekend** 510, and **Search** 512. As with the file card menu 402, file card menu 502 has an active area that can be moved by the viewer by operation of the arrow buttons 52-56 and double arrow buttons 60, 62 of controller 20 (shown in FIG. 3). Each of the interactive button represents another filtering that will be performed if it is selected. In FIG. 5, the **On Now** button 504 is highlighted, and if selected by actuating the **select** (✓) button 64, causes a third level display shown in FIG. 6 to appear and a further sorting and/or filtering of the data stored within RAM 40 (shown in FIG. 2).

Referring now to FIG. 6, display 600 shows what is on at the present time, which in this illustration is 6:30 p.m. A reduced representation 602 of all television shows that are on at the present time appears in FIG. 6. The reduced representation 602 presents each program that is presently on as a card in a tightly cascaded set of cards. The cards may be gray shade coded to distinguish between news shows, sport shows, dramatic shows, comedy shows, documentary shows and so forth. Those skilled in the art will recognize that color would be preferable for color television sets, and a method and apparatus according to the present invention using color to differentiated program types in the reduced representation 602 is contemplated. Thus, using visual coding within the reduced representation 602 would allow a sports program to visually stand out from the non-sports TV programming in the example shown. Up arrow 52 and Down arrow 54 respectively move a selection window 604, which is slightly wider than the items displayed in reduced representation, up and down the reduced representation 602 of the **On Now** subgroup in single steps. Motion of the active area along the reduced representation 602 is one dimensional, either up or down. The up arrows 60 and the down arrows 62 move this selection window 604 respectively up and down the reduced representation 602 in increments of six. The individual items visible and located within the selection window 604 represent a further subgroup of six programs out of the reduced representation 602 **On Now** subgroup. This six program subgroup of the selection window 604 is displayed in larger form in a grid display 606 located next to reduced representation 602. This larger form allows the viewer to read the titles of the programs presently in grid display 606. The visible coding, i.e. gray shade coding or color coding, of each item is retained in the larger form in grid display 606 to aid the viewer differentiate between the various types of programming offered.

Within selection window 604 and grid display 606 are active areas 605, 607 that highlight one item in their respective portions of display 600. The active areas 605, 607 move in coordination with each other in response to the Up arrow 52 and the Down arrow 54. When Up arrow 52 or Down arrow 54 require the active areas 605 and 607 to move above or below the selection window 604 and grid display 606, a paging occurs which moves the selection window up six or down six. When an item is located within active areas 605, 607, further information, such as the TV channel call sign, the cable channel number, and the exact start and stop times, is retrieved from the programming database stored in RAM 40 and displayed in the top of a frame 610 of display 600. If the **select** (✓) button 64 is actuated at this time, a preview of either a short text description or a brief still or motion video replaces the grid display 606. The data for these previews are stored in RAM 40. A second sequential actuation of the **select** (✓) button 64 actually selects the highlighted program in the active area 604 of reduced representation 602 and formerly highlighted in grid display 606. If the up arrow 52 or the down arrow 54 is actuated the respective preview for the next program item up or down from the previous previewed item is selected. The information displayed in the top of the frame 610 will change to the next program item up or down also. Actuation of the cancel button 66 returns the viewer to the previous arrangement of display 600. The bottom of the frame 610 lists the characteristics of the display 600, which are also retrieved from RAM 40. If the **query** (?) button 68 is actuated, the grid display 606 will be replaced by a generalized help menu. This generalized help menu has many buttons, as explained below, one of which is a view button. If the view button is actuated, the generalized help menu is replaced with the previous select (i.e. filter) view.

Referring now to FIGs. 3, and 7 a selection of a program by category will be described. Actuation of the **query** (?) button 68 of controller 20 causes display 700 to appear on the screen of TV 10 (shown in FIG. 1). On display 700 has a help button 702, a categories button 704, a view button 706, a begin button 708, a favorites button 710, and a user

in a reasonable amount of time, so further filtering, either by a shorter time period, i.e. **On Now**, or a narrower category, i.e. basketball, is needed. To change to a narrower category, the viewer presses the query (?) button 62 which causes display 700 (shown in FIG. 7) to be displayed. Next, categories button 704 is selected which causes display 900 (shown in FIG. 9) to be displayed. Next, basketball button 903 is selected which causes display 1500 of FIG. 15 to be displayed. The **Coming Up** time filter of FIGs. 12 and 13 has not been changed, so display 1500 shows the basketball programs coming up in the next 12 hours. As can be seen, the two-dimensional grid display 1500 contains approximately sixteen programs, which is sufficiently small to review each item individually in a reasonable time period. Moving active area 1502 around two-dimensional grid display 1500 with the up and down arrows 52, 54 and/or the right and left arrows 56, 58, causes the title and channel of each program to be displayed in the top of the frame of display 1500 to assist the reviewing and selection process. For example, the program highlighted by active area 1502 is "This Week In the NBA" and it is showing on CNN. Thus, by selective filtering the unwieldy display 1300 of programs shown in FIG. 13 is reduced to a manageable handful of display 1500, which the viewer can navigate through individually in a reasonable time.

Referring now to FIGs. 16-23, another aspect of the present invention will be described. In FIG. 16 and the remaining figures, a longer period of time is selected other than the one and a half hours or so retrieved by the **On Now** selection. For example, if the viewer wishes to look at the programming available for the rest of the week in order to select something to record on a VCR (not shown). Actuating the button having the number zero (0) of the keypad 50 while watching a program causes the data view menu selection card, such as 900 of FIG. 9, to appear at the point in the menu-display hierarchy where the last selection was made. Actuating the zero (0) button again moves the viewer towards the broadcast data view menu 400 of FIG. 4, and the viewer may stop at any display in order to change time or subject matter categories.

Thus if a viewer were watching *This Week in the NBA*, and wanted to find a program of interest that is on later, the viewer would first actuate the zero (0) button of keypad 50 which would bring up the display of FIG. 10. Actuating the zero (0) button four more times takes the viewer through displays 900, 800, 700 and 500 of FIGs. 9, 8, 7 and 5 respectively. To get a specific program title, the search button 509 is actuated, which causes FIG. 16 to logically overlay the display 500. FIG. 16 shows a first display 1600 of an interactive alphanumeric selection sequence. First, all alphabetic titles are sorted into groups of five or less. If, for example, *Nova* was the title of the desired program, the active area would be moved from its initial position (either at the top of the display or at the last group selected) to the group of letters containing the letter N using the up arrow 52 or the down arrow 54 as shown in FIG. 17 followed by actuation of the select (✓) button 64. This sequence would cause FIG. 18 to logically overlay FIG. 17. In FIG. 18, the active area is moved from its initial location at M to the location of N as shown in FIG. 17 followed again by actuation of the select (✓) button 64 causes the display 2000 of FIG. 20 to overlay FIG. 19. In display 2000 are single instances of the first two letters, such as NYPD Blue is the only instance of N followed by Y, and multiple instances of the two letter string as denoted by the double right pointing arrows by NO. To continue the search for *Nova*, the active area is moved to the line containing NO of display 2000 as shown in FIG. 21 using the down arrow 56 and actuating the select (✓) button 64, which causes display 2200 of FIG. 22 to overlay display 2000. Now, *Nova* is the only instance of a program beginning with NOV, so the entire title *Nova* appears in FIG. 22. By moving the active area to the line labeled NOVA in display 2200 and actuating the select (✓) button 64 causes the display 2300 shown in FIG. 23 to overlay display 2200 with a schedule of times and channels for the program series *Nova*.

FIG. 23 is a one week schedule that is laid out as a logical three dimensional grid. The days of the week are displayed along one side, in this case vertically along the left side, of the display 2300. Time of day is displayed along a perpendicular side, in this case horizontally across the top, for a twenty-four hour period. Thus, if an episode of *Nova* is scheduled at 8:00 p.m. on Sunday, a box of contrasting shade will be located in the intersection of the Sunday row and in the 8:00 p.m. column. The active area 2302 can be moved horizontally by arrows 56, 58 and vertically by arrows 52, 54 of keypad 50. If there are multiple occurrences of *Nova* on a particular night at a particular time, that fact is shown by a box, located at the intersection of the row of that day and the column of that time, having an asterisk (*) located in the box. The asterisk (*) indicates the presence of a logical stack of multiple programs of *Nova* appearing on competing channels, such as occurs on Wednesday night at 8:00 p.m. To move or navigate through a stack of programs (or stack of episodes of programs with the same name, for example) on a particular day at a particular time slot, the viewer uses the double up arrows button 60 and the double down arrows button 62 for this third degree of freedom. Because the display 2300 may require greater visual discrimination than program title as a matter of course, the frame information window 1904 is larger than usual for display 2300. Further, frame 2304 is annotated with arrows indicating the existence of program episodes above or below the active areas' position in the stack. If the cable 16 has access to 300 plus 'channels' of programming, it is conceivable that some programs, such as *Nova* will be offered by more than one channel at the same time. As described previously, once the viewer has moved the active area to a particular entry in two or three dimensions and actuates the select (✓) button 64, a selection is made. In this case, the selection sets an alarm to record a specific channel at a specific time at some day in the near future.

Referring back to FIGs. 1 and 2, overall operation of the apparatus of the invention is described. Program schedule

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===== COMING form code =====
This form displays a TV schedule for several hours of one day.
This version uses drawing methods for the program shapes
5  'as opposed to creating a control shape for each program)
  and "point & shoot" or "visually closest" navigation.

Option Explicit
Dim allData(8) As snapshot 'all data within time period
Dim filterData(8) As snapshot 'a snapshot for each day in the view
10 Dim NDays As Integer 'number of days in display
Dim NSlots As Integer 'number of time slots in display
Dim NStation As Integer 'number of stations in display
Dim MaxStation As Integer 'total number of stations in database
Dim colorField As String 'the database field that determines item color
15 '(the field should contain an integer)
Dim inPreview As Integer 'boolean 'should the preview message show?
Const sideGap = .05 'space at beginning and end of program
Const topGap = 4 'space btwn time label and first program shape
Dim refDate 'reference date for data time slots
Const lblHeight = 40 'height of day and time labels (in 500 scale)
20 Const MINProgWidth = .2 'minimum width of a program shape as fraction of slot
Dim slotsPerDay As Integer 'number of slots allowed per day
Dim currDay 'number of current day
Dim startTime 'start day and time of display

25 Dim TSBegin As Long 'first time slot
Dim TSEnd As Long 'last time slot
Dim TScurrent As Long 'current time slot
Dim rowOffset 'distance between (tops of) rows in the schedule

30 Sub ApplyFilter ()
  'filter program data, keeping only the programs that match the query in filters(TV)
  'also makes sure the number of stations is correct
  'and the DB field determining the color is set
  Dim i As Integer 'counter

35  If InStr(filters(currDomain), "Station") Then
    NStation = 10 'note: this probably should be a variable or const. not 10
    colorField = "Type"
  Else
    NStation = MaxStation
    colorField = "Category"
40  End If
  For i = 1 To NDays
    allData(i).Filter = filters(currDomain)
    Set filterData(i) = allData(i).CreateSnapshot()
  Next i
45 End Sub

Sub ChangeSel (d As String)
  'Performs the navigation according to the direction parameter
  Dim current, firstMatch 'database markers
  Dim success As Integer 'boolean
50  Dim s As Integer 'station

```



```

If Not success Then
  'check all to left for "closest"
  F.MoveFirst
  While Not F.EOF
    If F("StartTS") < TScurrent Then
      dist = VDistHoriz(F("Station"), F("FinishTS"), s, TScurrent)
      If dist < best Then
        'keep best so far
        best = dist
        success = True
        bestMark = F.Bookmark
      End If
    End If
    F.MoveNext
  Wend
  If success Then
    'move to best one
    F.Bookmark = bestMark
    TS = F("StartTS")
  End If
End If
ElseIf d = "Down" Then
  'check all programs below current one, keeping "closest"
  While Not F.EOF
    If F("Station") > s Then
      dist = VDistVert(s, TScurrent, e, F("Station"), F("StartTS"),
        F("FinishTS"))
      If dist < best Then
        best = dist
        success = True
        bestMark = F.Bookmark
      End If
    End If
    F.MoveNext
  Wend
  If success Then
    F.Bookmark = bestMark
    TS = F("StartTS")
  End If
ElseIf d = "Up" Then
  'check all programs above current one, keeping "closest"
  While Not F.BOF
    If F("Station") < s Then
      dist = VDistVert(s, TScurrent, e, F("Station"), F("StartTS"),
        F("FinishTS"))
      If dist < best Then
        best = dist
        success = True
        bestMark = F.Bookmark
      End If
    End If
    F.MovePrevious
  Wend
  If success Then

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        popup.Top = lblTime(1).Top + 2 * lblTime(1).Height
        popup.Left = 2
        popup.Width = slotsPerDay - 3
        popup.Visible = True
5      inPreview = True
    End Sub

    Sub DoSelect ()
        'set selection info and go to TV
10      userStation = filterData(currDay)("Station")
        userStart = filterData(currDay)("Start")
        returnCode = TOTV
        Me.Hide
    End Sub

15    Sub DrawProg (colorIndex, start, finish, station)
        'use drawing methods to draw a program shape
        'note: form.AutoRedraw should be set to true so the drawings are persistent
        Dim L, R, t, B 'left, right, top, bottom
        Dim dayStart
20      Dim edge

        'convert a day/time to position in NSlot scale
        dayStart = startTime + currDay - 1
        L = (start - dayStart) * 48
25      R = (finish - dayStart) * 48
        'clip shapes off at day boundaries
        If L < 0 Then L = 0
        If R > slotsPerDay Then R = slotsPerDay
        'place in correct day, with small gap between programs
        edge = (currDay - 1) * slotsPerDay
30      L = L - edge + sideGap
        R = R - edge - sideGap
        'correct for min width to make sure program will show up
        If R - L < MINProgWidth Then R = L + MINProgWidth
        'set top according to station
35      'note: this trick will not work if "favorite stations" are not numbered 1..n
        rowOffset = ((500 - 2 * lblHeight - shpProg(0).Height) / NStation)
        t = shpSlot(0).Top + topGAP + (station - 1) * rowOffset
        B = t + shpProg(0).Height
        'draw the box with the correct color
        drawwidth = 1
40      Me.FillStyle = 0 'solid
        Me.FillColor = Color(colorIndex Mod 9)
        Line (L, t)-Step(R - L, B - t), , B 'the line command with argument B draws a
        box
    End Sub

45    Sub Form_Activate ()
        'make necessary changes to display, reset info and status bars
        Dim i As Integer 'counter
        Static saveFilter As String

50      If saveFilter = filters(currDomain) Then sameFilter = True

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55

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        returnCode = SHORTCUT
        Me.Hide
    End Select

5
    'in any case
    If InPreview Then
        DoPreview
    Else
        popup.Visible = False
10    End If
End Sub

Sub Form_Load ()
    Dim i As Integer
15    Dim t As time

    'set form colors and fonts
    Me.BackColor = formCOLOR
    shpProg(0).BackColor = BorderColor
    lblDay(0).BackColor = backgroundCOLOR
20    lblAM.BackColor = backgroundCOLOR
    lblPM.BackColor = backgroundCOLOR
    selector.BorderColor = BorderColor
    dayLine(0).BorderColor = divideColor
    lblTime(0).ForeColor = slotCOLOR
25    shpSlot(0).BorderColor = slotCOLOR
    If displayMode = "TV" Then
        lblDay(0).FontSize = smallFONT
        lblTime(0).FontSize = smallFONT
        lblAM.FontSize = smallFONT
        lblPM.FontSize = smallFONT
30    popup.FontSize = mediumFONT
    Else
        lblDay(0).FontSize = largeFONT
        lblTime(0).FontSize = largeFONT
        lblAM.FontSize = largeFONT
35    lblPM.FontSize = largeFONT
        popup.FontSize = largeFONT
    End If

    'set scale and size objects
    SizeAForm Me, DispTop, DispHeight, DispLeft, DispWidth
    Me.Scale (0, 0) - (500, 500)
40    SizeAControl lblDay(0), 0, lblHeight, 0, 500
    'note: the AM/PM labels would be placed when time is filtered
    SizeAControl lblPM, 0, lblHeight, 0, 30
    SizeAControl lblAM, 0, lblHeight, 500 - 30, 30
    SizeAControl lblTime(0), lblHeight, lblHeight, 0, 50
45    SizeAControl shpSlot(0), 2 * lblHeight + .5 * topGAP, 500 - 2 * lblHeight, 0, 50
    SizeAControl popup, 250, 200, 250, 200
    selector.BorderWidth = 1
    dayLine(0).Y1 = 0
    dayLine(0).Y2 = 500
50    'initialize variables

55

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```

End Sub

Sub MakeDisplay ()
5  'create the display of programs from the data
    Dim i As Integer 'counter
    Dim d As Integer 'day
    Dim F As snapshot 'convenience

    If Not sameView Then
10      'would need to reset captions for times and day
    End If

    'place program shapes
    Cls 'clear the form of previous drawings
    DoEvents 'make it so
15    For d = 1 To NDays
        currDay = d
        'draw lines to separate time slots
        For i = 0 To slotsPerDay
            drawwidth = 4
20            Line (i, shpSlot(0).Top)-(i, 500), slotCCOLOR
        Next i
        'draw program shape for each program in data
        Set F = filterData(d)
        If Not F.EOF Then
25            F.MoveFirst
            Do While Not F.EOF
                DrawProg F(colorField), F("Start"), F("Finish"), F("Station")
                F.MoveNext
            Loop
            F.MoveFirst
30        End If
    Next d

    'initialize stuff
    TScurrent = TSBegin
35    currDay = 1
    shpProg(0).ZOrder
    selector.ZOrder
    Set F = filterData(currDay)
    'find a program to start on
    Do While TScurrent <= TSEnd
40        F.FindFirst Overlap(TScurrent, TScurrent)
        If Not F.NoMatch Then
            DisplayProg
            Exit Do
        End If
        TScurrent = TScurrent + 1
45    Loop
    'make sure TScurrent is in range
    If TScurrent > TSEnd Then TScurrent = TSBegin
End Sub

50 Sub Position (shape As Control, start, finish, station)

```

55

```

      If start1 > finish2 Then
        deltaT = Abs(start1 - finish2)
      ElseIf start2 > finish1 Then
        deltaT = Abs(start2 - finish1)
5      Else
        deltaT = 0
      End If
      VDistVert = deltaR + 2 * deltaT
10    End Function

'===== FRAME form code =====
'This form owns the standard info and status bars and allows
' transfer of control from form to form.
Option Explicit

15 Sub Form_Activate ()
  'decides which other form should show in its display area
  Select Case returnCode
    Case SHOWVIEW
      views(currDomain).Show
20    Case PICK
      frmSelect.Show
    Case TOTV
      frmTV.Show
    Case LASTVIEW
      sameFilter = True
      views(currDomain).Show
25    Case STARTUP
      'do nothing--don't want rolodex to show yet
    Case Else
      frmDex.Show
30    End Select
  End Sub

Sub Form_KeyDown (KeyCode As Integer, Shift As Integer)
  If KeyCode = Asc("Q") Then
35    End
  End If
End Sub

Sub Form_Load ()
  'set colors and fonts
40  Me.BackColor = formCOLOR
  sspInfo.FontSize = mediumFONT
  sspStatus.FontSize = mediumFONT
  'use builtin object to size background
  ScrWidth = Screen.Width
45  ScrHeight = Screen.Height
  If displayMode = "mini" Then
    'for taking screen prints
    ScrHeight = ScrHeight * .54
    ScrWidth = ScrWidth * .712
    displayMode = "TV"
50  Else

```

55

```

'database snapshots
Dim allData As snapshot
5 Dim itemData As snapshot
Dim storeData As snapshot
Dim deptData As snapshot
Dim stuffData As snapshot
Dim filterData As snapshot
10 Dim marker(1000) As String 'bookmarks of each MAXDISPLAY items
Dim locStart(1000) 'ritem index for start of locator

Sub ApplyFilter ()
'filter the data according to user choice
    Dim sortString As String
15
    If Me Is TVlist Then
        captionField = "Title"
        sortString = ""
        colorField = "Type"
    ElseIf Me Is MOVlist Then
20         If sameView Then
            'keep allData as it is
        Else
            'reset allData to all movies
            LoadData
25             allData.Filter = viewFilter
            Set allData = allData.CreateSnapshot()
        End If
        captionField = "Title"
        sortString = "Title"
        colorField = "Type"
30
    ElseIf Me Is SHOPlist Then
        'note: This would all be done totally differently. Don't bother
        '      understanding it, just rewrite it.
        Select Case filters(currDomain)
        Case "store"
35             browsing = "store"
            Set allData = storeData
            captionField = "name"
            filters(currDomain) = ""
            sortString = "name"
            colorField = ""
40
        Case "dept"
            browsing = "dept"
            deptData.FindFirst "name = " & userString & ""
            userString = "" 'fix--this is cheating, I shouldn't use userString
            If deptData.NoMatch Then
45                 Set allData = deptData
                filters(currDomain) = ""
            Else
                browsing = "stuff"
                filters(currDomain) = "[dept code] = " & deptData("code")
50                 Set allData = stuffData
            End If
        End If
55

```

```

Case "Up"
  If locSelected > 1 Then
    locSelected = locSelected - 1
    RedoDisplay
  End If
Case "Down"
  If locSelected < MAXLOC Then
    locSelected = locSelected + 1
    RedoDisplay
  End If
End Select
End Sub

Sub ChangeSel (direct As String)
  'navigate up or down one selection
  Select Case direct
    Case "Up"
      If itemSelected > 1 Then
        'move up within current display
        itemSelected = itemSelected - 1
        selector.Top = itemBox(itemSelected).Top - GAP
        rItem(0).Top = rItem(whichrItem(itemSelected)).Top
        rItem(0).Left = locL - GAP
        rItem(0).Width = locW + 2 * GAP
        SetItemInfo
      ElseIf locSelected > 1 Then
        'display previous section of list
        itemSelected = MAXDISPLAY
        locSelected = locSelected - 1
        RedoDisplay
      End If
    Case "Down"
      If itemSelected < MAXDISPLAY Then
        'move down within current display
        'do not move to select an empty item
        If (locSelected - 1) * MAXDISPLAY + itemSelected < MAXITEM Then
          itemSelected = itemSelected + 1
          selector.Top = itemBox(itemSelected).Top - GAP
          rItem(0).Top = rItem(whichrItem(itemSelected)).Top
          rItem(0).Left = locL - GAP
          rItem(0).Width = locW + 2 * GAP
          SetItemInfo
        End If
      ElseIf locSelected < MAXLOC Then
        'display next section of list
        itemSelected = 1
        locSelected = locSelected + 1
        RedoDisplay
      End If
    End Select
    rItem(0).Visible = True
  End Sub

Sub DoPreview ()

```

```

Sub EndPreview ()
'go back to regular list operation
  Dim i As Integer 'counter
5
  previewWin.Visible = False
  inPreview = False
  locator.Visible = True
  selector.Visible = True
  previewWin.Top = displayList.Top
10
  RedoDisplay
End Sub

Sub Form_Activate ()
  Dim i As Integer 'counter
  Dim section As Integer 'count the number of locator locations
15
  Dim NVisible As Integer 'tally the visible shapes in a section
  Dim msg As String
  Static saveFilter As String
  Static saveView As String

  'check new filters against current filters
  If Not sameView Then sameView = (saveView = viewFilter)
  saveView = viewFilter
  If Not sameFilter Then sameFilter = (saveFilter = filters(currDomain))
  saveFilter = filters(currDomain)
20

  SetStatus currView(currDomain) & currFilter(currDomain), greyCOLOR

  If sameFilter And sameView Then
    'keep everything the same as last time
    If newUser And Not Me Is SKOPlist Then
30
      button.* popup.Caption = "To change the category shown, press the 'Category'
        popup.Visible = True
        newUser = False
      End If
    Else
35
      'clean up display
      SetInfo "Selecting data, please wait...", GREY
      If MAXITEM = 0 Then
        previewWin.Caption = ""
        previewWin.Visible = False
40
      End If
      DoEvents
      If inPreview Then EndPreview

      For i = 1 To MAXDISPLAY
45
        itemBox(i).Caption = ""
      Next i

      For i = 1 To MAXITEM
        Unload rItem(i)
50
      Next i
    End If
  End Sub
55

```



```

      If filterData("StartTS") < TS Then
        rItem(i).Left = rItem(i).Left - reducedEXTRA
        rItem(i).Width = rItem(i).Width + reducedEXTRA
      End If
      If filterData("FinishTS") > TS Then
        rItem(i).Width = rItem(i).Width - reducedEXTRA
      End If
    End If
    rItem(i).ZOrder
    rItem(i).Visible = True
    filterData.MoveNext
  Next i
  MAXLOC = section
  locStart(section + 1) = MAXITEM + 1

  'set Length of minselector (use rItem(0))
  rItem(0).Left = locL - GAP
  rItem(0).Width = locW + 2 * GAP

  'initialize selector and locator
  itemSelected = 1
  locSelected = 1
  locator.Visible = True
  rItem(0).BackColor = highlightCOLOR
  'set the captions in the itemBoxes
  RedoDisplay
End If
End If
End Sub

Sub Form_KeyDown (KeyCode As Integer, Shift As Integer)
  popup.Visible = False
  Select Case KeyCode
    Case Asc("Q")
      End
    Case B_BACK
      If Me Is SHOPlist And browsing = "item" Then
        'not exactly what we want
        returnCode = ALPHA
        Me.Hide
      Else
        returnCode = BACK
        Me.Hide
      End If
    Case B_HELP
      InvokeHelp
    Case B_PREVIEW
      If inPreview Then
        EndPreview
      Else
        DoPreview
      End If
    Case B_SELECT
      If MAXITEM > 0 Then DoSelect

```

```

        previewWin.FontSize = mediumFONT
        popup.FontSize = smallFONT
    End If
5   rItem(0).BackColor = itemCOLOR
    selector.FillColor = highlightCOLOR
    displayList.FillColor = backgroundCOLOR
    previewWin.BackColor = backgroundCOLOR
    locator.FillColor = backgroundCOLOR
    itemBox(0).BackColor = itemCOLOR
10   leftArrow(0).BackColor = itemCOLOR
    rightArrow(0).BackColor = itemCOLOR
    shpSlot.BorderColor = slotCOLOR
    'size the objects to the screen
    SizeAForm Me, DispTop, DispHeight, DispLeft, DispWidth
15   Me.Scale (0, 0)-(1000, 1000)
    SizeAControl locator, T - GAP, H + GAP, locL - GAP, locW - 2 * GAP
    SizeAControl shpSlot, T, H, locL - reducedEXTRA, locW - 2 * reducedEXTRA
    SizeAControl displayList, T - GAP, H - GAP, dispL, dispW
    SizeAControl popup, dispW / 2, 4 * locW, dispW / 2, 4 * locW
20   CPlace 1, previewWin, displayList
    locator.ZOrder
    shpSlot.ZOrder
    rItem(0).ZOrder
    itemRoom = H / MAXDISPLAY
    SizeAControl itemBox(0), T + (.5 * GAP), itemRoom - GAP, dispL + EXTRA, dispW -
25   2 * EXTRA
    SizeAControl patch(0), 50, (.68 * itemBox(0).Height), (12.3 * itemBox(0).Width),
    (7 * itemBox(0).Height)
    If displayMode = 'TV' Then
        patch(0).Left = 8.08 * itemBox(0).Width
        patch(0).Height = 3.7 * itemBox(0).Height
30   End If
    SizeAControl leftArrow(0), T + (.5 * GAP), itemRoom - GAP, dispL, EXTRA
    SizeAControl rightArrow(0), T + (.5 * GAP), itemRoom - GAP, dispL + dispW -
    EXTRA, EXTRA
    SizeAControl selector, T, itemRoom + GAP, dispL, dispW
35   selector.ZOrder
    For i = 1 To MAXDISPLAY
        'Load itemBox(i) 'Now created at design time--fixed number (6)
        itemBox(i).Visible = False
        CCopy itemBox(0), itemBox(i)
40   patch(i).Visible = False
        CPlace 0, patch(i), patch(0)
        itemBox(i).Top = itemBox(0).Top + (i - 1) * itemRoom
        Load leftArrow(i)
        leftArrow(i).Top = itemBox(i).Top
        Load rightArrow(i)
45   rightArrow(i).Top = itemBox(i).Top
    Next i

    'load the list data and set up the display
    sameFilter = False
    sameView = False
50   LoadData

```

55

'set the captions in the itemBoxes to correspond to items in locator
'reposition locator and selector, update info box

```

5      Dim last As Integer
      Dim i As Integer
      Dim Index As Integer 'index of ritem

      If MAXITEM = 0 Then Exit Sub
      'figure first item location
10     filterData.Bookmark = marker(locSelected)

      Index = locStart(locSelected)
      For i = 1 To MAXDISPLAY
          If filterData.EOF Then
15             'hide empty itemBox
             itemBox(i).Caption = ""
             itemBox(i).Visible = False
             leftArrow(i).Visible = False
             rightArrow(i).Visible = False
          Else
20             whichRitem(i) = Index 'so we can highlight the correct ritem (reduced
item)
             If colorField <> "" Then itemBox(i).BackColor =
Color(filterData(colorField) Mod 9)
             itemBox(i).Caption = filterData(captionField)
             If Not inPreview Then itemBox(i).Visible = True
25             If Me Is TVlist And Not inPreview Then
                 'show arrows to reflect program length
                 If filterData("StartTS") < TS Then
                     leftArrow(i).BackColor = itemBox(i).BackColor
                     leftArrow(i).Visible = True
30                 Else
                     leftArrow(i).Visible = False
                 End If
                 If filterData("FinishTS") > TS Then
                     rightArrow(i).BackColor = itemBox(i).BackColor
                     rightArrow(i).Visible = True
35                 Else
                     rightArrow(i).Visible = False
                 End If
                 'show color patch for subcategory
                 patch(i).FillColor = Color(filterData("Category") Mod 9)
40                 patch(i).Visible = True
             End If
             last = i
             Index = Index + 1
             filterData.MoveNext
45         End If
      Next i

      'Do not allow blank to be selected
      If itemSelected > last Then
          itemSelected = last
50     End If

```

55

```

5      '==== MESSAGE form code =====
      'This form is used by Help and some lists to display information.
      ' temporarily covering up the current form.
      Option Explicit

      Const GAP = 500

10     Sub Form_Activate ()
        TextArea.Caption = userMsg
      End Sub

      Sub Form_KeyDown (KeyCode As Integer, Shift As Integer)
15         Select Case KeyCode
            Case Else
                returnCode = KeyCode
                Me.Hide
            End Select
        End Sub

20     Sub Form_Load ()
        'set colors and fonts
        Me.BackColor = itemCOLOR
        TextArea.BackColor = itemCOLOR
        TextArea.FontSize = largeFONT
25         'set sizes
        SizeAForm Me, DispTop, DispHeight, DispLeft, DispWidth
        SizeAControl TextArea, GAP, DispHeight - 2 * GAP, GAP, DispWidth - 2 * GAP
        'initialize
        TextArea.Caption = ""
30     End Sub

      '==== ROLODEX form code =====
      'This form shows the main menu and filter menus.
      'Unimplemented: Have filter button color correspond to type/category color
      Option Explicit

35     Dim BlinkControl As Control 'pointer to blinking highlight
      Dim parent As Integer 'number of parent card
      Dim current As Integer 'number of current card

40     'special cards
      'note: these must be updated each time the number of filter cards in the card
      datafile changes
      Const filterCARD = 1 'TV filter menu
      Const mfilterCARD = 68 'movie filter menu
      Const homeCARD = 96 'main menu
45     Dim lastCard As Integer 'holds number of regular card while in filter

      Const MAXTITLE = 3 'WARNING: A change in MAXTITLE requires a change in code for
      LoadGraphics
      Const CARDSHIFT = 2.5 'for card display--amount change in card placement
      Const MAXROWS = 3 'for card display--number of rows of buttons
50     Const MAXCOLS = 3 'for card display--number of columns of buttons on a card

```

55

```

sspCont.BackColor = sspCard(0).BackColor
Zoom 10, sspCont, sspCard(depth)
DisplayCard cardNo
sspCont.Visible = False
5   End If
Case "Select"
  index = Cards(current).selected
  If index > 0 Then
    CCopy sspItem(index), sspCont
10   sspCont.Visible = True
    sspCont.BackColor = sspCard(0).BackColor
    SizeAControl sspCard(0), 0, 500, 0, 500 'size of whole form
    Zoom 10, sspCont, sspCard(0)
  End If
15  End Select
End Sub

Sub BlinkStart (C As Control, vis)
  'enable blinking object
  Set BlinkControl = C
20  BlinkControl.Visible = vis
  tmrBlink.Enabled = True
End Sub

Sub BlinkStop (vis)
25  'stop blinking object, leaving visibility as vis
  tmrBlink.Enabled = False
  If BlinkControl Is Nothing Then
    'do nothing
  Else
    BlinkControl.Visible = vis
30  End If
  Set BlinkControl = Nothing
End Sub

Sub ButtonAction ()
35  'perform action associated with selected button
  Dim button As Integer
  Dim cardNo As Integer
  Dim msg As String

  button = Cards(current).selected 'item number of selected button on parent card
40  cardNo = Cards(current).item(button) 'card number of selected button
  If button < 1 Then Exit Sub

  Select Case Cards(cardNo).actionCode
  Case actNONE
    'an inactive button
    SetInfo "This option is not yet available.", greyCOLOR
45  Case actNEXT
    'display the next card
    Animate "Next", Cards(current).item(button)
  Case actDOMAIN
50  'change current domain before going to the next card

```

55

```

Case actALPHASHOP
  'get a string from user, search for items beginning with user string
  'note: this would probably be very different
  5   Animate "Select", 0
      SetStatus "Shopping, " & Cards(cardNo).name, greyCOLOR
      msg = Cards(cardNo).actionData
      SetInfo msg, YELLOW
      Wait frmAlpha
      If returnCode <> BACK And userString <> "" Then
        10      sameFilter = False
            filters(currDomain) = "item"
            Set views(currDomain) = listFrm(currDomain)
            returnCode = SHOWVIEW
            Me.Hide
      End If
      15   Case actALPHATV
          'allow user to select a show title
          Animate "Select", 0
          SetStatus "TV, " & Cards(cardNo).name, greyCOLOR
          returnCode = PICK
          20   Me.Hide
      Case actALPHAMOV
          'This is not hooked up to work, but would probably be
          ' a lot like actALPHTV
          Animate "Select", 0
          25   Case actFILTER
              'send a new filter to a TV view
              filters(currDomain) = Cards(cardNo).actionData
              currFilter(currDomain) = Cards(cardNo).infotext
              sameFilter = False
              sameView = True
              30   returnCode = SHOWVIEW
                  Me.Hide
          Case actMOVIE
              'show a movie list
              Animate "Select", 0
              35   If current > homeCARD Then
                  'the view (a filter) is changing
                  currView(currDomain) = Cards(cardNo).infotext
                  viewFilter = Cards(cardNo).actionData
                  sameView = False
                  sameFilter = False
                  40   Else
                      'the category is changing
                      currFilter(currDomain) = " " & Cards(cardNo).infotext
                      filters(currDomain) = Cards(cardNo).actionData
                      sameView = True
                      sameFilter = False
                      45   End If
                  Set views(currDomain) = listFrm(currDomain)
                  returnCode = SHOWVIEW
                  Me.Hide
          Case actSTORE
              50   'show a list of stores

```

```

currDomain = TV
filters(currDomain) = ""
sameFilter = False
5 sameView = True
Set views(currDomain) = listFrm(currDomain)
returnCode = SHOWVIEW
Me.Hide
Case actKEYS
'Only for development, wouldn't stay
10 SetKeys Cards(cardNo).actionData
SetStatus Cards(cardNo).infotext, itemCOLOR
current = homeCARD
DisplayCard current
Case actTABS
'only for development
15 ToggleTabs
Case Else
MsgBox "Bad action code for card " & Cards(cardNo).name
Stop
End
20 End Select
End Sub

Sub ChangeSel (direct As String)
'do button navigation
25 Dim n As Integer
Dim last As Integer, Sel As Integer
n = Cards(current).NItems
last = Cards(current).selected
If last = 0 Then Exit Sub

30 If direct = "Right" Then
'move right with wrap around
If last = n Then
Sel = 1
Else
35 Sel = last + 1
End If
ElseIf direct = "Left" Then
'move left with wrap around
If last = 1 Then
Sel = n
40 Else
Sel = last - 1
End If
ElseIf direct = "Up" Then
'move up, no wrap around
45 If last > MAXCOLS Then
Sel = last - MAXCOLS
Else
Sel = last
End If
ElseIf direct = "Down" Then
50 'move down, no wrap around

```

55

```

NItems = Cards(current).NItems

5  Set Area = sspCard(Cards(current).level)'this is a pointer, not a copy
   'calculate size of button
   Dx = Area.Width * .9 / MAXCOLS
   Dy = Area.Height * .9 / MAXROWS
   w = Dx * .9
10  If w > 30 Then w = 30
   h = Dy * .9
   If h > 20 Then h = 20

   sspBlinkBG.Visible = False
   sspBlinkBG.ZOrder 0 'bring to front
   'place and show each button
15  For i = 1 To NItems
     sspItem(i).Width = w
     sspItem(i).Height = h
     sspItem(i).Caption = Cards(Cards(current).item(i)).name
     If Cards(Cards(current).item(i)).actionCode = actNONE Then
20       'turn inactive buttons grey
       sspItem(i).BackColor = greyCOLOR
     Else
       sspItem(i).BackColor = itemCOLOR
     End If
     x = Area.Left + .05 * Area.Width + ((i - 1) Mod MAXCOLS) * .5 * Dx
     Y = Area.Top + .05 * Area.Height + (Int((i - 1) / MAXCOLS) * .5) * Dy
     CenterItem sspItem(i), x, Y
     sspItem(i).ZOrder 0
     sspItem(i).Visible = True
30  Next i
   'make blinker bigger than buttons
   CPlace 2, sspBlinkBG, sspItem(1)

   'hide unused buttons
   For i = NItems + 1 To MAXITEM
35     sspItem(i).Visible = False
   Next i
   UpdateSel
End Sub

Sub Form_Activate ()
40  'check for a return code from another form
   sspCont.Visible = False
   Select Case returnCode
     Case BACK
       If current < homeCARD Then current = lastCard
45       SetStatus "Use arrows and select or use keypad.", greyCOLOR
       DisplayCard current
       UpdateSel
     Case SHORTCUT
       current = homeCARD
       SetStatus "Use arrows and select or use keypad.", greyCOLOR
50       DisplayCard current

```

55


```

Case B_PAGEDOWN
'Use numeric key pad to choose a button directly, without navigation
Case B_1
5   If Cards(current).NItems > 0 Then
      Cards(current).selected = 1
      UpdateSel
      ButtonAction
    End If
Case B_2
10  If Cards(current).NItems > 1 Then
      Cards(current).selected = 2
      UpdateSel
      ButtonAction
    End If
Case B_3
15  If Cards(current).NItems > 2 Then
      Cards(current).selected = 3
      UpdateSel
      ButtonAction
    End If
Case B_4
20  If Cards(current).NItems > 3 Then
      Cards(current).selected = 4
      UpdateSel
      ButtonAction
    End If
Case B_5
25  If Cards(current).NItems > 4 Then
      Cards(current).selected = 5
      UpdateSel
      ButtonAction
    End If
Case B_6
30  If Cards(current).NItems > 5 Then
      Cards(current).selected = 6
      UpdateSel
      ButtonAction
    End If
Case B_7
35  If Cards(current).NItems > 6 Then
      Cards(current).selected = 7
      UpdateSel
      ButtonAction
    End If
Case B_8
40  If Cards(current).NItems > 7 Then
      Cards(current).selected = 8
      UpdateSel
      ButtonAction
    End If
Case B_9
45  If Cards(current).NItems > 8 Then
      Cards(current).selected = 9
      UpdateSel
    End If
50

```

55

```

sspCard(i).Top = sspCard(i - 1).Top + CARDSHIFT
sspCard(i).ZOrder
Load sspTitle(i)
5 sspTitle(i).Top = sspCard(i).Top + sspTitle(0).Height + 2
  Select Case (i Mod MAXTITLE)
    'note: these cases are not flexible for different MAXTITLE
    Case 1
      sspTitle(i).Left = sspCard(i).Left
    Case 2
10 sspTitle(i).Left = sspCard(i).Left + sspCard(i).Width / 2 -
      sspTitle(i).Width / 2
    Case 0
      sspTitle(i).Left = sspCard(i).Left + sspCard(i).Width - sspTitle(i).Width
    End Select
    sspTitle(i).ZOrder
15 Next i
End Sub

Sub PopulateCards ()
  'This subroutine reads in the card data from the
  'CARDFILE file defined as a constant. The cards
20 'will be numbered 1 to the number of lines (cards)
  'in the file. All special cards should come before
  'the home card (by convention), and are named as
  'constants in the declarations. Each card record
25 'should have a level (integer), item selected (integer),
  'a name (string), an info string (string), and
  'an action code (integer). If the action code is greater
  'than actNEXT, one additional input (variant type) is read
  'for the card.
  Dim last As Integer, parent As Integer
  Dim selected As Integer
  Dim index As Integer, itemNo As Integer
  Dim level, title, text, action
  Open CARDFILE For Input As #1

30 'make dummy parent for top level
  index = 0
  Cards(index).name = "root"
  Cards(index).level = 0
  Cards(index).NItems = 0
  While Not EOF(1)
40 last = index
    index = index + 1
    Input #1, level, selected, title, text, action
    Cards(index).level = level
    Cards(index).selected = selected
    Cards(index).name = title
45 Cards(index).infotext = text
    Cards(index).actionCode = action
    If action > actNEXT Then
      Input #1, action
      Cards(index).actionData = action
50 End If
  End Sub

```

55

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```

i = Cards(current).selected
If i > 0 Then 'something is selected
    Set S = sspItem(i) 'S is pointer to button
    'find center of button
5    x = S.Left + S.Width / 2
    Y = S.Top + S.Height / 2
    'put blinker behind button
    CenterItem sspBlinkBG, x, Y
    'resume blinking
10    BlinkStart sspBlinkBG, True
End If
text = Cards(Cards(current).item(Cards(current).selected)).infotext
color = sspItem(Cards(current).selected).BackColor
SetInfo text, color
15 End Sub

Sub Zoom (n As Integer, C As Control, Dest As Control)
'animates control C changing size to control Dest
    Dim i As Integer, j As Integer
    Dim dl, dw, dt, dh
20    dl = (Dest.Left - C.Left) / n
    dw = (Dest.Width - C.Width) / n
    dt = (Dest.Top - C.Top) / n
    dh = (Dest.Height - C.Height) / n
    C.ZOrder
    C.AutoSize = False
25    For i = 1 To n
        C.Move C.Left + dl, C.Top + dt, C.Width + dw, C.Height + dh
        C.Refresh
    Next i
End Sub
30

'===== SELECT form code =====
'This form is another attempt at alphabetic input that allows only valid input.
' It relies on the TV titles database which has two tables. The reference table is
used first
35 ' and contains a count of all items starting with each letter of the alphabet or
with a
' symbol or number. The user is first presented with a list of possible starting
letters
' (each item in the first on-screen list may have several letters in it). Once a
starting
40 ' letter is chosen, a snapshot is made of matching entries from the table of titles.
' Each list the user sees has only valid choices for the next letter, or full titles
if
' a particular title is distinguished from all others by the letters chosen so far.
' The best way to understand is to see the form in action before reading the code.
45 ' The code could easily be modified to work with other data such as lists of movies,
etc.
'note: the non-proportional font used in the itemBoxes is Courier New
Option Explicit
Dim DB As database 'the full database

50 Dim list(1000) As String 'the list of selection strings

```

55

```

        If locSelected < MAXLOC Then
            locSelected = locSelected + 1
            RedoDisplay
5         End If
    End Select
End Sub

Sub ChangeSel (direct As String)
    'Perform list navigation
10    Select Case direct
        Case "Up"
            If itemSelected > 1 Then
                'move up within items currently displayed
                itemSelected = itemSelected - 1
                selector.Top = itemBox(itemSelected).Top - GAP
                rItem(0).Top = locator.Top - rowOffset * (itemSelected - 1)
                SetItemInfo
            ElseIf locSelected > 1 Then
                'display previous section of the list
                itemSelected = MAXDISPLAY
                locSelected = locSelected - 1
                RedoDisplay
20            End If
        Case "Down"
            If itemSelected < MAXDISPLAY Then
                'move down within items currently displayed
                'do not move to select an empty item
                If (locSelected - 1) * MAXDISPLAY + itemSelected < MAXITEM Then
                    itemSelected = itemSelected + 1
                    selector.Top = itemBox(itemSelected).Top - GAP
                    rItem(0).Top = locator.Top + rowOffset * (itemSelected - 1)
                    SetItemInfo
30                End If
            ElseIf locSelected < MAXLOC Then
                'display next section of list
                itemSelected = 1
                locSelected = locSelected + 1
                RedoDisplay
35            End If
        End Select
    End Sub

40    Sub DoSelect ()
        'finish with leaf value or create a new list based on user's choice of prefix
        Dim index As Integer
        Dim count As Integer
        Dim i As Integer
        Dim nextChar As String
        Dim looking As Integer 'boolean
        Dim title As String

        index = locStart(locSelected) - itemSelected - 1 'index in list of item
        selected
50        If leaf(index) Then

```

55

```

End If

'data assumed to be already sorted
If Not initialList Then
5   'still need to create new list from data
    Set filterData = filterData.CreateSnapshot()
    filterData.MoveFirst
    listEnd = 0
    For i = Asc(" ") To Asc("z") 'space, punctuation, and letters
10   'note: should be fixed up by not trying every single one, go stright to
next db item's char
    count = 0: looking = True
    While Not filterData.EOF And looking
        nextChar = Mid(filterData("SelectTitle"), Len(currPrefix) + 1.
15   1)
        If nextChar = Chr(i) Or nextChar = LCase(Chr(i)) Then
            count = count + 1
            filterData.MoveNext
        Else
            looking = False
20   End If
    Wend
    Select Case count
    Case 0 'do not add to list
    Case 1 'make a leaf entry
        filterData.MovePrevious
25   listEnd = listEnd + 1
        list(listEnd) = fixAmpersand((filterData("SelectTitle")))
        leaf(listEnd) = True
        filterData.MoveNext
    Case Else 'make a non-leaf entry
        filterData.MovePrevious
30   listEnd = listEnd + 1
        list(listEnd) = currPrefix & "&" & Chr(i) 'underline new char
        'note: underlining is just one mechanism for emphasizing what is
different
        leaf(listEnd) = False
35   filterData.MoveNext
    End Select
Next i
If filterData.RecordCount <= MAXDISPLAY Then
    'redo the list to have just leaves in it, if they all fit in one
40   display
        listEnd = 0
        filterData.MoveFirst
        While Not filterData.EOF
            listEnd = listEnd + 1
            list(listEnd) = fixAmpersand((filterData("SelectTitle")))
45   leaf(listEnd) = True
            filterData.MoveNext
        Wend
    End If
End If
50
55

```

```

Dim itemRoom

'set colors and fonts
5 itemBox(0).FontSize = largeFONT
  rightArrow(0).FontSize = largeFONT
  rItem(0).BackColor = itemCOLOR
  selector.FillColor = highlightCOLOR
  displayList.FillColor = backgroundCOLOR
10 locator.FillColor = backgroundCOLOR
  itemBox(0).BackColor = itemCOLOR
  rightArrow(0).BackColor = itemCOLOR
  shpSlot.BorderColor = slotCOLOR
'size and place the objects to the screen
15 SizeAForm Me, DispTop, DispHeight, DispLeft, DispWidth
  Me.Scale (0, 0)-(1000, 1000)
  SizeAControl locator, T - GAP, H + GAP, locL - GAP, locW + 2 * GAP
  SizeAControl shpSlot, T, H, locL + reducedEXTRA, locW - 2 * reducedEXTRA
  SizeAControl displayList, T - GAP, H + GAP, dispL, dispW
  locator.ZOrder
20 shpSlot.ZOrder
  rItem(0).ZOrder
  itemRoom = H / MAXDISPLAY
  SizeAControl itemBox(0), T + (.5 * GAP), itemRoom - GAP, dispL + EXTRA, dispW -
2 * EXTRA
  SizeAControl leftArrow(0), T + (.5 * GAP), itemRoom - GAP, dispL, EXTRA
25 SizeAControl rightArrow(0), T + (.5 * GAP), itemRoom - GAP, dispL + dispW -
EXTRA, EXTRA
  SizeAControl selector, T, itemRoom + GAP, dispL, dispW
  selector.ZOrder
  For i = 1 To MAXDISPLAY
30     Load itemBox(i)
        itemBox(i).Visible = False
        itemBox(i).Top = itemBox(0).Top + (i - 1) * itemRoom
        Load rightArrow(i)
        rightArrow(i).Top = itemBox(i).Top
  Next i
35 End Sub

Sub LoadData ()
  Dim refSnap As snapshot
  Const MAXTOGETHER = MAXDISPLAY 'number of letter allowed in one itemBox
40 Dim together

  'fill initial selection list
  listEnd = 0
  Set DB = OpenDatabase(TVTitles)
  Set allData = DB.CreateSnapshot("Titles")
45 'create initial list
  Set refSnap = DB.CreateSnapshot("Reference")
  refSnap.MoveFirst
  together = MAXTOGETHER 'indicate need for new item
  While Not refSnap.EOF
50     Select Case refSnap("Number")

```

55

```

rItem(0).Visible = False
rItem(0).Top = T
rItem(0).Left = locL + reducedEXTRA
5 rItem(0).Width = locW - 2 * reducedEXTRA
rItem(0).BackColor = itemCOLOR
filterData.MoveFirst
'size and place the item shapes
'and set section bookmarks
section = 0 'number of locator locations
10 For i = 1 To MAXITEM
    Load rItem(i)
    rItem(i).Top = T + (i - 1) * rowOffset
    If ((i - 1) Mod MAXDISPLAY) = 0 Then
        'begin a new locator location
15         section = section + 1
        locStart(section) = i
    End If
    If Not leaf(i) Then
        rItem(i).Width = rItem(i).Width + reducedEXTRA
20    End If
    rItem(i).ZOrder
    rItem(i).Visible = True
Next i
MAXLOC = section
locStart(section + 1) = MAXITEM + 1
25 'set length of minselector
'use rItem(0) as mini selector
rItem(0).Left = locL - GAP
rItem(0).Width = locW + 2 * GAP
30 'initialize selector and locator
itemSelected = 1
locSelected = 1
rItem(0).BackColor = highlightCOLOR
35 'set the captions in the itemBoxes
RedoDisplay
End Sub

Sub RedoDisplay ()
40 'set the captions in the itemBoxes to correspond to items in locator
'reposition locator, selector and set item info in info box

Dim last As Integer 'number of last item in display
Dim i As Integer 'counter
Dim index As Integer 'index of item in list
45 index = locStart(locSelected)
For i = 1 To MAXDISPLAY
    If index > MAXITEM Then
        'hide empty itemBox
        itemBox(i).Caption = ""
50        itemBox(i).Visible = False
    End If
    index = index + 1
Next i
55

```

```

        index = locStart(locSelected) + itemSelected - 1
        If leaf(index) Then
            'get full title from data
            Set F = filterData
5           F.FindFirst "SelectTitle = '" & list(index) & "'"
            msg = F("FullTitle")
        Else
            msg = "Titles beginning with '" & list(index) & "'"
        End If
10        SetInfo msg, (itemBox(itemSelected).BackColor)
    End If
End Sub

Sub tmrBlink_Timer ()
15    BlinkControl.Visible = Not BlinkControl.Visible
End Sub

'===== START form code =====
'This startup form allows the developer to choose display mode
' (either for PC, TV, or mini PC for making screen prints)
' then starts the actual program by calling Main
20 Option Explicit

Sub Form_Load ()
    returnCode = STARTUP
25 End Sub

Sub miniButton_Click ()
    displayMode = "mini"
    Unload Me
    Main
30 End Sub

Sub PCbutton_Click ()
    displayMode = "PC"
    Unload Me
35 End Sub

Sub TVbutton_Click ()
    displayMode = "TV"
    Unload Me
40 End Sub

'===== TV form code =====
'This form pretends to show a TV program or record it, if it is not currently on
45 Option Explicit

Const GAP = 700

Sub Form_Activate ()
50    Dim msg As String

```



```

Case Asc("Q")
End
Case Else
    returnCode = BACK
    Me.Hide
End Select
End Sub

Sub Form_Load ()
    textArea.Caption = ""
    textArea.FontSize = largeFONT
    SizeAForm Me, 0, ScrHeight, 0, ScrWidth
    SizeAControl textArea, GAP, ScrHeight - 2 * GAP, GAP, ScrWidth - 2 * GAP
End Sub

'===== TV_GUIDE form code =====
'General remarks:
'    The Main procedure starts the ball rolling by showing the Frame, loading
'all the forms, and then showing the rolodex menu. Control is transferred from form
'to form through the use of the returnCode variable (see list of return codes in
'global declarations). The frmDex, for example, sets the returnCode to SHOWVIEW, and
'hides itself. This causes frmFrame to become active. frmFrame looks at the
returnCode
'and shows the current domain's view form. Communication between forms is done
through
'a variety of variables, since a form's procedures are not accessible from outside.

Option Explicit
'.....
'    Global Declarations
'.....

'database constants
Global Const CARDFILE = "c:\pctv\db\cards2.txt"
Global Const MVDB = "c:\pctv\db\plots.mdb"
Global Const SPDB = "c:\pctv\db\shopping.mdb"
Global Const TVDB = "c:\pctv\db\big.mdb"
Global Const TVTitles = "c:\pctv\db\titles.mdb"
Const CATDB = "c:\pctv\db\cats.mdb"
Dim typeTable As table 'TV type IDs
Dim catTable As table 'TV category IDs
Dim statTable As table 'station IDs
Global fakeToday 'keep the day constant
Global fakeTime 'keep the time constant
Global displayMode As String 'display set for "PC" or "TV" (affects size of fonts
and graphics)
Global newUser As Integer 'boolean 'when true, give extra helps

Global ScrWidth, ScrHeight
Global DispTop, DispHeight, DispLeft, DispWidth 'display area available to forms
inside the frame

'Colors
Global Const highlightCOLOR = &H8080FF 'redish
Global Const backgroundCOLOR = &H80FFFF 'yellow

```

```

Global Const FILTER = 5
Global Const COMING = 6
Global Const SHOWVIEW = 9
5 Global Const ALPHA = 10
Global Const PICK = 11
Global Const STARTUP = 12

.....
10 Define Type Card
    for rolodex
.....
Global Const MAXITEM = 9 'max number of buttons on a card

'Represents one index card as viewed on screen
15 Type Card
    self As Integer 'item number of self on parent
    level As Integer 'number of cards away from root
    name As String 'text to appear on button/card
    infoText As String 'text for info bar
    actionCode As Integer 'code for action to take when chosen
20    actionData As String 'extra info needed for action
    parent As Integer 'number of parent card
    NItems As Integer 'number of buttons visible on card
    Item(MAXITEM) As Integer 'array of card pointers (one for each button on card)
    selected As Integer 'the number of the selected button
25 End Type

'Array of up to MAXCARDS index cards
Global Const MAXCARDS = 1000
Global Cards(MAXCARDS) As Card

30 .....
    Remote Buttons
.....
'assigned values in sub SetKeys
Global B_BACK
Global B_HELP
35 Global B_PREVIEW
Global B_UP
Global B_DOWN
Global B_LEFT
Global B_RIGHT
40 Global B_SELECT
Global B_PAGEUP
Global B_PAGEDOWN
Global B_1
Global B_2
45 Global B_3
Global B_4
Global B_5
Global B_6
Global B_7
50 Global B_8
Global B_9

```

55

EP 0 735 749 A2

' KEY_A thru KEY_Z are the same as their ASCII equivalents: 'A' thru 'Z'
 ' KEY_0 thru KEY_9 are the same as their ASCII equivalents: '0' thru '9'

```

5  Global Const KEY_NUMPAD0 = &H60
    Global Const KEY_NUMPAD1 = &H61
    Global Const KEY_NUMPAD2 = &H62
    Global Const KEY_NUMPAD3 = &H63
    Global Const KEY_NUMPAD4 = &H64
10  Global Const KEY_NUMPAD5 = &H65
    Global Const KEY_NUMPAD6 = &H66
    Global Const KEY_NUMPAD7 = &H67
    Global Const KEY_NUMPAD8 = &H68
    Global Const KEY_NUMPAD9 = &H69
15  Global Const KEY_MULTIPLY = &H6A
    Global Const KEY_ADD = &H6B
    Global Const KEY_SEPARATOR = &H6C
    Global Const KEY_SUBTRACT = &H6D
    Global Const KEY_DECIMAL = &H6E
    Global Const KEY_DIVIDE = &H6F
20  Global Const KEY_F1 = &H70
    Global Const KEY_F2 = &H71
    Global Const KEY_F3 = &H72
    Global Const KEY_F4 = &H73
    Global Const KEY_F5 = &H74
    Global Const KEY_F6 = &H75
25  Global Const KEY_F7 = &H76
    Global Const KEY_F8 = &H77
    Global Const KEY_F9 = &H78
    Global Const KEY_F10 = &H79
    Global Const KEY_F11 = &H7A
    Global Const KEY_F12 = &H7B
30  Global Const KEY_F13 = &H7C
    Global Const KEY_F14 = &H7D
    Global Const KEY_F15 = &H7E
    Global Const KEY_F16 = &H7F
35  Global Const KEY_NUMLOCK = &H90
  
```

Function CategoryString (typeCode As Integer, catCode As Integer) As String
 'creates user-readable string for a TV program's category

```

40  Dim msg As String

    msg = "Category: "
    'look up type code
    typeTable.Index = "ID"
    typeTable.Seek "=", typeCode
45  If typeTable.NoMatch Then
        msg = msg & typeCode
    Else
        msg = msg & typeTable("Name")
    End If
50  msg = msg & ". " 'all on one line, replaced: Chr(13) & "Subcategory: "
  
```

55

```

        DayString = "Tuesday"
    Else
        DayString = "Tue"
    End If
5   Case 4
    If length = "long" Then
        DayString = "Wednesday"
    Else
        DayString = "Wed"
10  End If
    Case 5
    If length = "long" Then
        DayString = "Thursday"
    Else
        DayString = "Thur"
15  End If
    Case 6
    If length = "long" Then
        DayString = "Friday"
    Else
        DayString = "Fri"
20  End If
    Case 7
    If length = "long" Then
        DayString = "Saturday"
25  Else
        DayString = "Sat"
    End If
    End Select
End Function

30  Function fixAmpersand (text As String)
    'put in a "&&" for every "&" so ampersand will print instead of format an underline
    Dim i As Integer
    Dim oldText As String
    Dim newText As String
35  newText = ""
    oldText = text
    While InStr(oldText, "&")
        i = InStr(oldText, "&")
        newText = Left(oldText, i - 1) & "&&"
40  oldText = Right(oldText, Len(oldText) - i)
    Wend
    fixAmpersand = newText & oldText
End Function

45  Sub InvokeHelp ()
    'add parameter for current location or give each form a local InvokeHelp
    'would be specialized for each view, probably not each button
    TellUser "Press Help (?) again for general help, or press any button on the
    remote for help with that button."
    Select Case returnCode
50  Case B_HELP

```

55

```

viewFilter = "Year >= 1993"
currView(MOVIE) = "Recent Movies"
currFilter(MOVIE) = ": All Categories"
5   SetStatus "Movies", greyCOLOR
    Load listFrm(MOVIE)
    'Shopping forms
    currDomain = SHOP
    filters(SHOP) = ""
    SetStatus "Shopping, compact disks", greyCOLOR
10   Load listFrm(SHOP)
    'TV forms
    currFilter(TV) = "Basketball"
    currDomain = TV
    filters(TV) = "Category = 19"
15   userString = "Nova"
    'Load frmWeek
    'Load listFrm(TV)
    'Load frmComing
    'Load frmWkday
    'Load frmSelect
20
    'show main menu
    SetStatus "Use arrows and select or use keypad.", greyCOLOR
    frmDex.Show
End Sub

25   Function Overlap (beginTS, endTS) As String
    'create query string to look for TV programs in the range between
    'and including beginTS and endTS
    Overlap = "(StartTS <= " & Str(endTS) & " And FinishTS >= " & Str(beginTS) & ")"
30   End Function

Sub SetInfo (text As String, Color)
    'update the info box text and color
    Dim s As SSPanel
    Set s = frmFrame!sspInfo 'works as long as form is loaded
35   s.BackColor = Color
    s.Caption = text
End Sub

Sub SetKeys (mode As String)
    'Set the keymappings for keyboard or "remote"
40   B_1 = KEY_NUMPAD7
    B_2 = KEY_NUMPAD8
    B_3 = KEY_NUMPAD9
    B_4 = KEY_NUMPAD4
    B_5 = KEY_NUMPAD5
45   B_6 = KEY_NUMPAD6
    B_7 = KEY_NUMPAD1
    B_8 = KEY_NUMPAD2
    B_9 = KEY_NUMPAD3
    If mode = "TV" Then
        'use keypad for all buttons (except 1-9)
50   B_BACK = KEY_SUBTRACT

```

55

```

statTable.Seek "=", s
If statTable.NoMatch Then
    MsgBox "illegal station ID " & s
    Stop
End If
StationString = statTable("Name")
End Function

Sub TellUser (message As String)
'displays message on screen until key is pressed
'probably would not be used
    userMsg = message
    Wait frmMsg
End Sub

Function TimeLabel (t) As String
'returns null string for times on half hour.
'returns hour 1..12 otherwise
    Dim s As String
    s = Format(t, "hh:mm AM/PM")
    If Mid(s, 4, 2) = "30" Then
        TimeLabel = ""
    Else
        s = Format(s, "h AM/PM")
        'strip off AM/PM
        TimeLabel = Left(s, Len(s) - 3)
    End If
End Function

Function TimeString (aDate) As String
'format a date as 12-hour time without AM/PM or leading zero
    Dim theTime As String
    theTime = Format(aDate, "hh:mm AM/PM")
    theTime = Left(theTime, 5) 'take just "hh:mm" part
    If Left(theTime, 1) = "0" Then
        theTime = Right(theTime, 4)
    End If
    TimeString = theTime
End Function

Sub Wait (F As Form)
'Allows one form to wait for another to hide itself
    F.Show
    While (F.Visible)
        DoEvents
    Wend
End Sub

'===== WEEK form code =====
Option Explicit
'stacked channel view to be used with TV search and
'possibly other minimal searches (would need modification in ApplyFilter)

Dim allData(9) As snapshot 'all data within time period

```

```

'move to later time. same day
F.FindNext "StartTS > " & Str(TS)
success = Not F.NoMatch
If success Then
5   'check if info arrows needed
    TS = F("StartTS")
    F.MoveNext
    If Not F.EOF Then
        If F("StartTS") = TS Then
10      infoArrows "down"
        Else
            infoArrows "none"
        End If
    Else
        infoArrows "none"
15   End If
    F.MovePrevious
End If
Case "Left"
'move to earlier time, same day
20   F.FindPrevious "StartTS < " & Str(TS)
    success = Not F.NoMatch
    If success Then
        TS = F("StartTS")
        'go to top of column
        F.FindFirst "StartTS = " & Str(TS)
25   TS = F("StartTS")
        'check if info arrows needed
        F.MoveNext
        If Not F.EOF Then
            If F("StartTS") = TS Then
30      infoArrows "down"
            Else
                infoArrows "none"
            End If
        Else
            infoArrows "none"
35   End If
        F.MovePrevious
    End If
Case "Down"
'move to later day, trying to keep close to previous time slot
40   If NProgs < 1 Then Exit Sub 'do nothing if all snapshots empty
    aDay = aDay + 1: TS = TS + 48
    While Not success And aDay <= NDays
        Set F = filterData(aDay)
        F.FindFirst "StartTS > " & Str(TS)
45   If F.NoMatch Then
        'no prog to right, look left for any programs
        If Not F.EOF Then F.MoveLast
        If Not F.EOF Then
            success = True
            TS = F("StartTS")
50   End If
    End If

```

55

```

      If Not F.EOF Then
        success = True
        TS = F("StartTS")
      End If
5      Else
        'save program to right, count time slots away, look left
        marker = F.Bookmark
        best = F("StartTS") - TS
        F.FindLast "StartTS <= " & Str(TS)
10      If F.NoMatch Then
        'no prog to left, take program to right
        F.Bookmark = marker
        TS = TS + best
      Else
        'check distances
15      If TS - F("StartTS") > best Then
        'right prog closest
        F.Bookmark = marker
        TS = TS - best
      Else
20      'left prog closest
        TS = F("StartTS")
      End If
      End If
      'either way, we found a program
      success = True
25      End If
      aDay = aDay - 1: TS = TS - 48
    Wend
    aDay = aDay + 1: TS = TS + 48
    If success Then
30      'make sure to be at the top of a column
      F.FindFirst "StartTS = " & Str(TS)
      If F.NoMatch Then Stop 'how did we get a TS with no program in it?
      TS = F("StartTS")
      'check if info arrows needed
35      F.MoveNext
      If Not F.EOF Then
        If F("StartTS") = TS Then
          infoArrows = "down"
        Else
          infoArrows = "none"
40      End If
      Else
        infoArrows = "none"
      End If
      F.MovePrevious
45      End If
    Case "Next"
      'find next program, same time and day
      F.MoveNext
      If Not F.EOF Then
        'success means still in same time slot
50      success = F("StartTS") = TS

```

55


```

Sub DisplayProg ()
'set info box with current program info and highlight position
    Dim F As snapshot
    Dim msg As String

    Set F = filterData(currDay)
    msg = StationString(F("Station")) & " : " & Format(F("Start"), "h:mm AM/PM")
    msg = msg & " to " & Format(F("Finish"), "h:mm AM/PM. ")
    msg = msg & Format(F("Title"))
    msg = msg & Chr(13) & "(episode info here)" & Format(F("Episode"))
    'note: current database does not contain episode information
    SetInfo msg, Color(F(colorField) Mod 9)

    shpProg(0).Visible = False
    selector.Visible = False
    Position shpProg(0), F("StartTS"), F("FinishTS")
    CPlace 0, selector, shpProg(0)
    shpProg(0).Visible = True
    selector.Visible = True

End Sub

Sub DoPreview ()
'Construct an appropriate preview message and display
    Dim msg As String

    msg = filterData(currDay)("Title")
    msg = msg & Chr(13) & "on " & StationString(filterData(currDay)("Station")) &
    Chr(13)
    msg = msg & CategoryString((filterData(currDay)("Type")),
    (filterData(currDay)("Category")))
    msg = msg & Chr(13) & DayString(Weekday(filterData(currDay)("Start")), "long")
    msg = msg & ", " & Format(filterData(currDay)("Start"), "mmmm d. yy h:mm AM/PM")
    msg = msg & Chr(13) & " to " & Format(filterData(currDay)("Finish"), "h:mm
    AM/PM")

    popup.Caption = msg
    SizeAControl popup, (lblTime(1).top + 1.5 * lblTime(1).Height), 12,
    (lblDay(1).Width), 45
    popup.Visible = True
    inPreview = True

End Sub

Sub DoSelect ()
'set data for selection and go to TV
    userStation = filterData(currDay)("Station")
    userStart = filterData(currDay)("Start")
    returnCode = TOTV
    Me.Hide

End Sub

Sub DrawProg (duplicates As Integer, index As Integer)
'draw a program shape in display, marking it if there are duplicates at the
    identical time slot

```

```

        ApplyFilter
        MakeDisplay
        sameFilter = True
5      End If
      End Sub

      Sub Form_KeyDown (KeyCode As Integer, Shift As Integer)
        Dim index As Integer
        Dim n As Integer
10      Select Case KeyCode
        Case Asc("Q")
          End
        Case B_BACK
          returnCode = BACK
15        Me.Hide
        Case B_HELP
          sameFilter = True
          InvokeHelp
        Case B_PREVIEW
          If inPreview Then
20            inPreview = False
            popup.Visible = False
          Else
            inPreview = True
          End If
        Case B_RIGHT
25        ChangeSel ("Right")
        Case B_LEFT
          ChangeSel ("Left")
        Case B_UP
          ChangeSel ("Up")
30        Case B_DOWN
          ChangeSel ("Down")
        Case B_SELECT
          If Not filterData(currDay).EOF Then DoSelect
        Case B_PAGEDOWN
35        ChangeSel ("Next")
        Case B_PAGEUP
          ChangeSel ("Prior")
        Case B_FILTER
          'go back to frmSelect to choose a new title
          returnCode = PICK
40        Me.Hide
        Case B_0
          returnCode = SHORTCUT
          Me.Hide
        End Select
45      If inPreview Then
        DoPreview
      Else
        popup.Visible = False
      End If
50    End Sub

```

55

```

'put AM/PM label across top
SizeAControl lblDay(0), infoHeight, timeHeight, dayWidth, NSlots
lblDay(0).Caption = "AM"           NOON           PM"
5  lblDay(0).Visible = True
'put time labels across top
SizeAControl lblTime(0), (lblDay(0).Height) + infoHeight, timeHeight, 0, 2
For i = 1 To NSlots \ 2
    Load lblTime(i)
    lblTime(i).Caption = TimeLabel(DateAdd("h", (i - 1), fakeTODAY))
10    lblTime(i).Left = 2 * i - 2
    lblTime(i).Visible = True
Next i
NProgs = 0
sameFilter = False
15  InputData
    Form_Activate
End Sub

Sub infoArrows (direct As String)
'show or hide arrows in info box indicating presence of more programs at identical
20  time
    Select Case direct
        Case "up"
            downArrow.Visible = False
            upArrow.Visible = True
        Case "down"
25         upArrow.Visible = False
            downArrow.Visible = True
        Case "both"
            upArrow.Visible = True
            downArrow.Visible = True
        Case "none"
30         upArrow.Visible = False
            downArrow.Visible = False
    End Select
End Sub

35  Sub InputData ()
    'part of form_load
    'opens the database and creates allData snapshots

    Dim DB As database
    Dim RefSnap As snapshot
    Dim i As Integer

    Set DB = OpenDatabase(TVDB)

45    'get reference date and number of stations
    Set RefSnap = DB.CreateSnapshot("Reference")
    RefSnap.FindFirst "Name = 'Date'"
    refDate = DateValue(RefSnap("Date"))
    RefSnap.FindFirst "Name = 'NStations'"

50    Set allData(0) = DB.CreateSnapshot("Programs")

```

55

```

d = 1
currDay = 1
While d <= NDays
  If filterData(d).EOF Then
5     d = d + 1
  Else
    NProgs = 1 'just to make sure it is more than 0
    currDay = d
    d = NDays + 1
10    End If
  Wend
  shpProg(0).ZOrder
  selector.ZOrder
  If Not filterData(currDay).EOF Then
    TScurrent = filterData(currDay)("StartTS")
15    DisplayProg
    ChangeSel "none"
  End If
End Sub

20 Sub Position (shape As Control, start, finish)
  'position a program shape
  Dim leftTS
  Dim rightTS
  Const smallGAP = .1

25  'convert to time slot scale
  leftTS = start - 46 * (currDay - 1)
  rightTS = finish - 48 * (currDay - 1)
  'set left and width
  shape.Left = dayWidth + leftTS
  shape.Width = rightTS - leftTS + 1 - smallGAP
30  'cut off at beginning of day
  If shape.Left < dayWidth Then
    shape.Width = shape.Width - (dayWidth - shape.Left)
    shape.Left = dayWidth
  End If
35  'set top and height
  shape.Height = 2 - 2 * smallGAP
  shape.top = lblDay(currDay).top + smallGAP
End Sub

40 Sub SetInfo (msg As String, Color)
  'override the global SetInfo to write to my own info panel
  infoPanel.BackColor = Color
  infoPanel.Caption = msg
End Sub

45 '***** WKDAY form code *****
Option Explicit
'schedule of 5 weekdays at a particular time
'uses time-slot guided navigation

50 Dim allData(8) As snapshot 'all data within time period

```

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```

'place program shapes
hasProgs = 0
c = 0 'init count of shpProgs
On Error GoTo ErrorHandler 'if we run out of shpProgs to allocate
5 For d = 1 To NDays
    currDay = d
    Set F = filterData(d)
    'create a shape control for each TV program in the data
    If Not F.EOF Then
10 F.MoveFirst
        Do While Not F.EOF
            Load shpProg(c + 1)
            c = c + 1 'increment only after allocate succeeds
            shpProg(c).BackColor = Color(F(colorField) Mod 9)
            Position shpProg(c), F("Start"), F("Finish"), F("Station")
15 shpProg(c).ZOrder
            shpProg(c).Visible = True
            F.MoveNext
        Loop
        F.MoveFirst
20 If hasProgs = 0 Then hasProgs = d 'remember the first day with programs
    in it
    End If
    Next d
MoveOn:
25 On Error GoTo 0 'quit trapping errors internally
    'make day lines visible on top
    For d = 1 To NDays - 1
        dayLine(d).ZOrder
        dayLine(d).Visible = True
    Next d
30
    'initialize stuff
    NProgs = c
    currDay = hasProgs
    shpProg(0).ZOrder
    selector.ZOrder
35 If currDay > 0 Then
    'set time slot begin and end numbers for current day
    TSBegin = DateDiff("n", refDate, startTime) \ 30 + 48 * (currDay - 1)
    TSEnd = TSBegin + slotsPerDay - 1
    TScurrent = TSBegin
40 Set F = filterData(currDay)
    Do While TScurrent <= TSEnd
        F.FindFirst Overlap(TScurrent, TScurrent)
        If Not F.NoMatch Then
            DisplayProg
45 Exit Do
        End If
        TScurrent = TScurrent + 1
    Loop
    Else
50 TSBegin = DateDiff("n", refDate, startTime) \ 30
    TSEnd = TSBegin + slotsPerDay - 1

```

55

```

TScurrent = TSBegin
currDay = 1
End If
5 shpSlot(TScurrent - TSBegin + 1 + (currDay - 1) * slotsPerDay).FillStyle =
  0'solid
  lblTime(TScurrent - TSBegin + 1 + (currDay - 1) * slotsPerDay).BackStyle =
  1'opaque
  Exit Sub
10 ErrorHandler:
  If Err = 342 Then
    'ran out of room to allocate program shapes, quit drawing
    Resume MoveOn
  Else
    Dim msg
    15 msg = Error & Chr(13) & "Resume or Cancel?"
    msg = InputBox(msg, "Error Correction", "Resume")
    If msg = "" Then Stop
    Resume MoveOn
  End If
20 End Sub

Sub Position (shape As Control, start, finish, station)
  'position a program shape for display
  Dim relativeL, relativeW, dayStart
25 Dim edge
  'convert a day/time to position in NSlot scale
  dayStart = startTime + currDay - 1
  relativeL = (start - dayStart) * 48
  relativeW = (finish - dayStart) * 48 - relativeL
30 'clip shapes off at day boundaries
  If relativeL < 0 Then
    relativeW = relativeW + relativeL
    relativeL = 0
  End If
  If relativeW + relativeL > slotsPerDay Then relativeW = slotsPerDay - relativeL
35 'set left and width of shape
  edge = (currDay - 1) * slotsPerDay
  shape.Left = relativeL - edge + sideGap
  shape.Width = relativeW - 2 * sideGap
  'enforce minimum width so program is visible
  40 If shape.Width < MINProgWidth Then shape.Width = MINProgWidth
  'set top according to station
  'note: this scheme only works because stations are named 1..n
  rowOffset = ((500 - 2 * lblHEIGHT - shpProg(0).Height) / NStation)
  shape.Top = shpSlot(0).Top + topGAP + (station - 1) * rowOffset
45 End Sub
50

```

Thus, it will now be understood that there has been disclosed a method and apparatus of finding and selecting a program to view from a large schedule of TV programs. While the invention has been particularly illustrated and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form, details, and applications may be made therein. For example, color coding of the individual items of the reduced representations and of the various entries in the various grid displays could be used to assist the viewer in making rapid program selections. Another example is that it is easily within the capabilities of this art to modify a TV set by integrating the set top box according to the present invention into it. It is accordingly intended that the appended

claims shall cover all such changes in form, details and applications which do not depart from the true spirit and scope of the invention.

5 Claims

1. Apparatus for selecting an item from a group thereof in a system having display means and interactive movable pointing means for specifying a location in the display means and making a selection at a specified location, the apparatus comprising:
 - 10 filtration means including subgroup specifiers in the display means and responsive to selection of a subgroup specifier by the pointing means for filtering the group to produce the subgroup specified by the selected subgroup specifier;
 - 15 means for displaying representations of group items belonging to at least a portion of the subgroup in the display means; and
 - group item selection means for selecting a group item by selecting the representation thereof in the display in response to the pointing means.
2. The apparatus set forth in claim 1 wherein:
 - 20 the pointing means need only be movable from one representation to an adjacent representation.
3. The apparatus set forth in claim 1 wherein:
 - 25 the means for displaying the representations comprises:
 - first means for displaying the representations in a single dimension; and
 - second means for displaying the representations in two dimensions.
4. The apparatus set forth in claim 1 further comprising:
 - 30 means for displaying a reduced representation of the entire subgroup and an indication in the reduced representation of the portion of the group being presently displayed by the display means.
5. The apparatus set forth in claim 4 wherein said reduced representation is two dimensional.
6. The apparatus set forth in claim 5, wherein said interactive movable pointing means includes a remote control having:
 - 35 a first pair of buttons to control changes in location in the display in a first direction; and
 - a second pair of buttons to control changes in location in the display in a second direction.
7. The apparatus set forth in claim 4 wherein said reduced representation is a two dimensional representation of a three dimensional representation, the third dimension being location within a logical stack of items having at least one common property.
8. The apparatus set forth in claim 7 wherein each item of a logical stack have viewing timeslot as one common property.
9. A method comprising the steps of:
 - 50 receiving program schedule data by a set top box via a same information conductor that conducts program information to the set top box;
 - filtering said program schedule data in RAM within said set top box;
 - said set top box showing a first interactive display on a TV connected thereto presenting a plurality of choices for filtering said program schedule data to a viewer;
 - 55 in response to an interactive selection by said viewer, filtering said program schedule data into a first subgroup of program schedule data;
 - also in response to an interactive selection by said viewer, said set top box showing a second interactive display on said TV having a second plurality of choices for filtering said program schedule data;
 - in response to a second interactive selection by said viewer, filtering said first subgroup into a second subgroup;

and
also in response to a second interactive selection by said viewer, said set top box showing a third interactive display on said TV having a representation of each program item of said second subgroup.

- 5 10. The method of claim 9, wherein said receiving program schedule data step further comprises the steps of

receiving a first portion of said program schedule data via said set top box; and
receiving a second portion of said program schedule data at a later non-contiguous time.
- 10 11. The method of claim 9, further comprising the step of:
in response to an interactive highlighting of a representation of a program item of said second subgroup,
displaying a title thereof.
12. The method of claim 11, further comprising the step of:
15 in response to an actuation of a select button of a remote control, displaying a preview of said highlighted program.
13. The method of claim 12, further comprising the step of:
in response to a second actuation of said select button of said remote control, switching said set top box to
20 display a TV program corresponding to said highlighted representation.
14. The method of claim 12, further comprising the step of:
in response to a second actuation of said select button of said remote control, storing a command to switch
said set top box to display a TV program corresponding to said highlighted representation in when that TV program
25 begins.
15. A method comprising the steps of:

receiving program schedule data for at least 300 individual channels for a time period of at least a week;
30 storing said program schedule data in local memory for rapid sorting and retrieval in a database format;
filtering the program schedule data in response to interactive user inputs into a subgroup of the program
schedule data;
displaying the subgroup of the program schedule data for the user's review; and
interactively selecting a program from the subgroup of program schedule data for viewing on a TV screen.
35
16. A method for choosing a desired program from a large schedule of programs whose data is stored in a local
memory, comprising the steps of:

displaying a vertically cascaded group of cards with each card representing a program of a particular time and
40 channel;
displaying a selection window located around a subgroup of said group of cards;
displaying a two-dimensional grid adjacent to said vertically cascaded group of cards in which said subgroup
of the programs represented by said vertically cascaded group of cards are shown in greater detail;
displaying a first active area within said selection window highlighting one of said subgroup of programs;
45 displaying a second active area within said two-dimensional grid, said second active area being located around
and highlighting greater details of the program highlighted in said first active area;
moving said first active area in a vertical direction in response to vertical direction arrows to a viewer's input
of a remote control; and
selecting a desired program by moving said active area to said desired program and actuating a select button
50 until said set top box makes said selection.
17. The method according to claim 16, further comprising the steps of
after said active area is moved one location outside of said selection window by inputs from said viewer,
moving said selection window to a contiguous subgroup to which said active area has moved.
55
18. Apparatus for selecting an item from a group thereof in a system having display means and interactive movable
pointing means for specifying a location in the display means and making a selection at a specified location, the
apparatus comprising:

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filtration means including subgroup specifiers in the display means and responsive to selection of a subgroup specifier by the pointing means for filtering the group to produce the subgroup specified by the selected subgroup specifier;
means for displaying representations of group items belonging to the subgroup in the display means;
5 group item selection means for selecting a group item by selecting the representation thereof in the display in response to the pointing means; and
means for displaying a reduced representation of the entire subgroup and an indication in the reduced representation of the portion of the group being presently displayed by the display means;
10 said reduced representation displaying means displaying a two dimensional representation of a three dimensional representation, a third dimension being represented as a logical stack of items having at least one common property.

19. The apparatus set forth in claim 5 or 18, wherein said interactive movable pointing means includes a remote control having:

15 a first pair of buttons to control changes in location in the display in a first direction; and
a second pair of buttons to control changes in location in the display in a second direction; and
a third pair of buttons to control changes in location within the logical stack.

FIG. 1

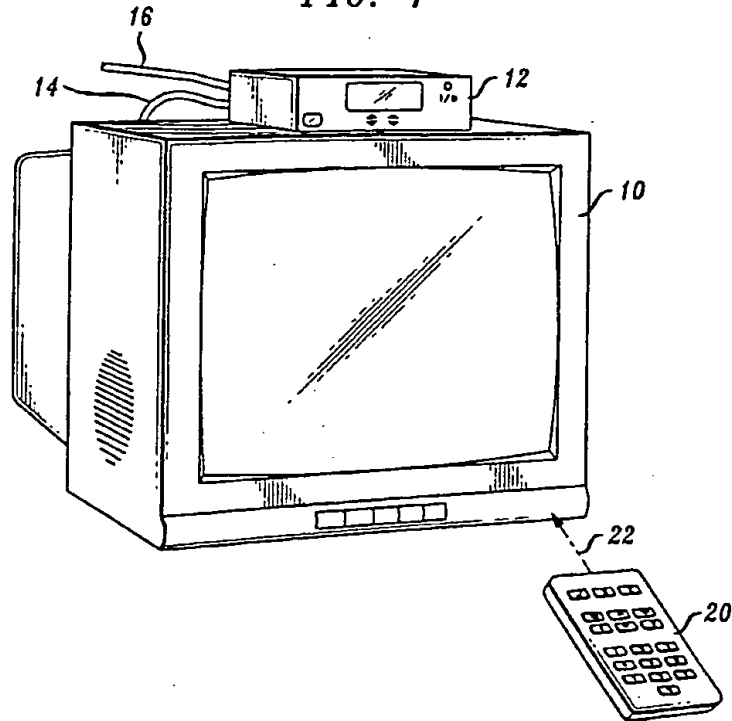


FIG. 2

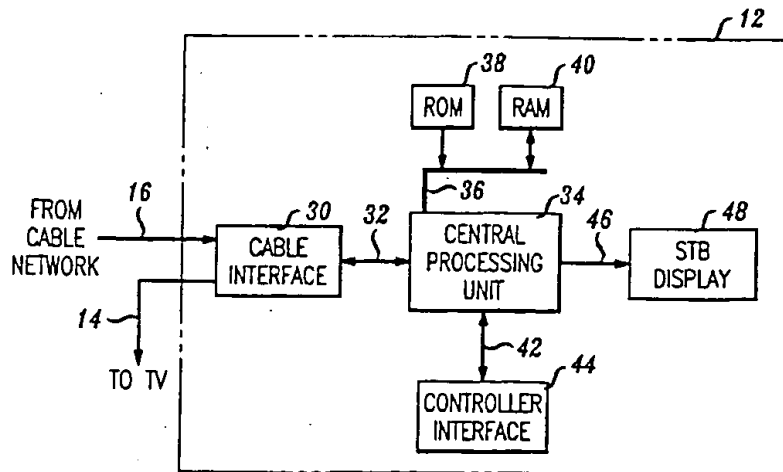


FIG. 3

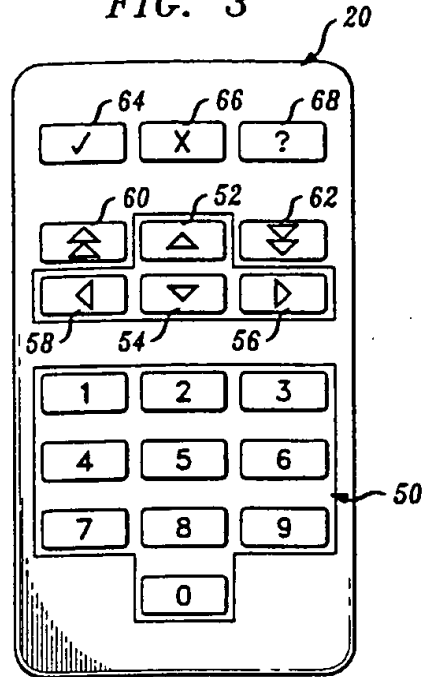


FIG. 4

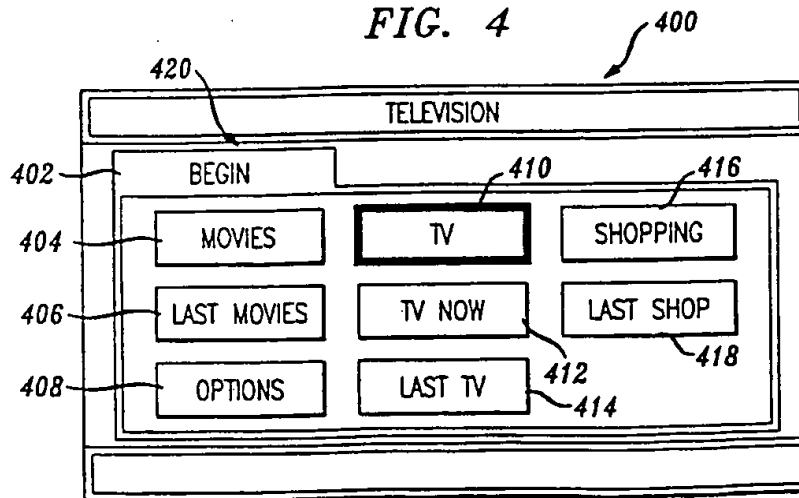


FIG. 5

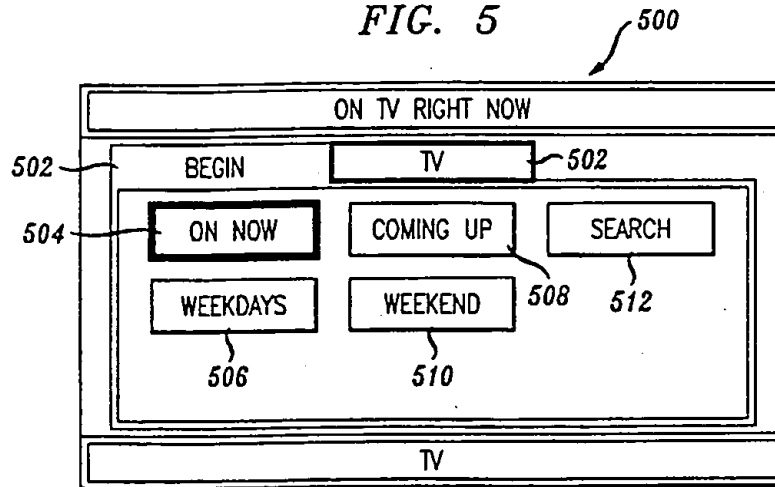


FIG. 6

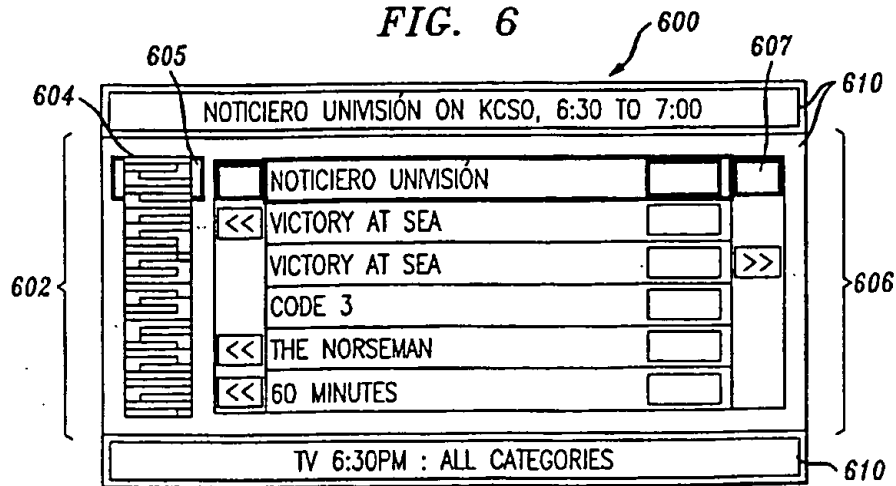


FIG. 7

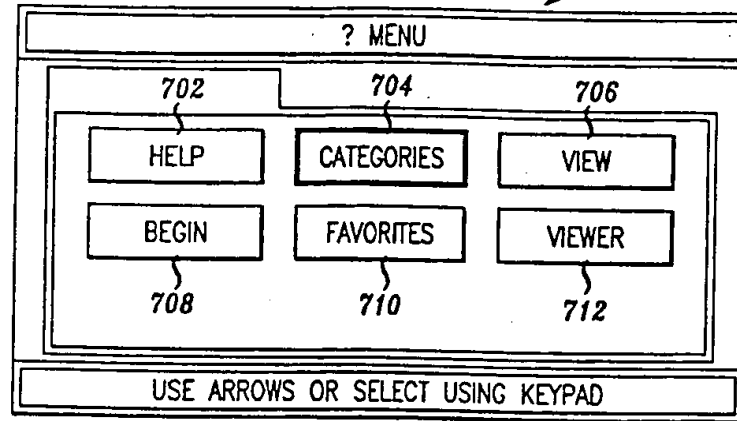


FIG. 8

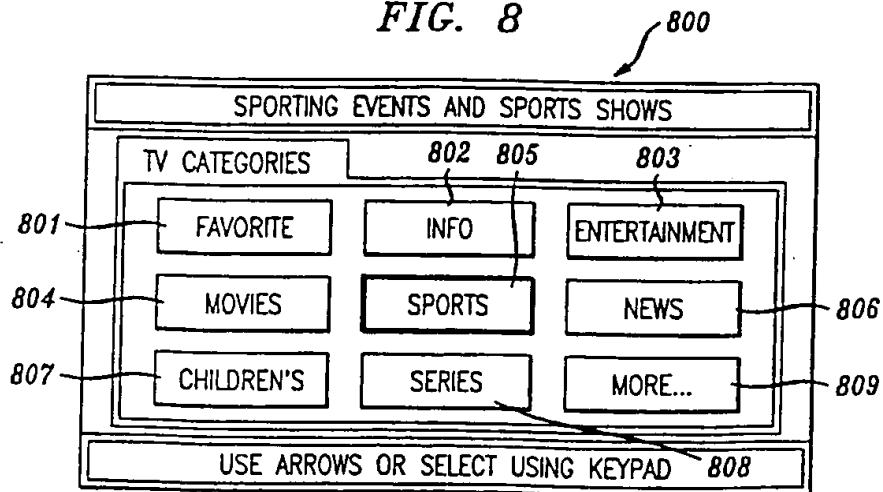


FIG. 9

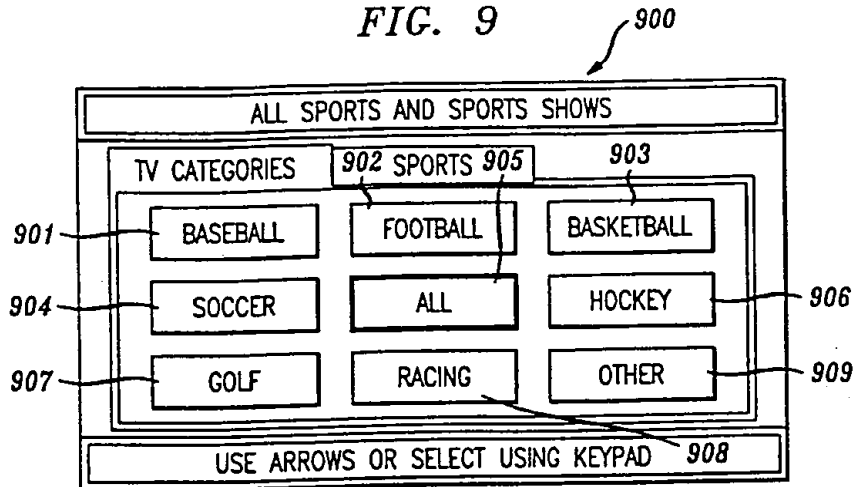


FIG. 10

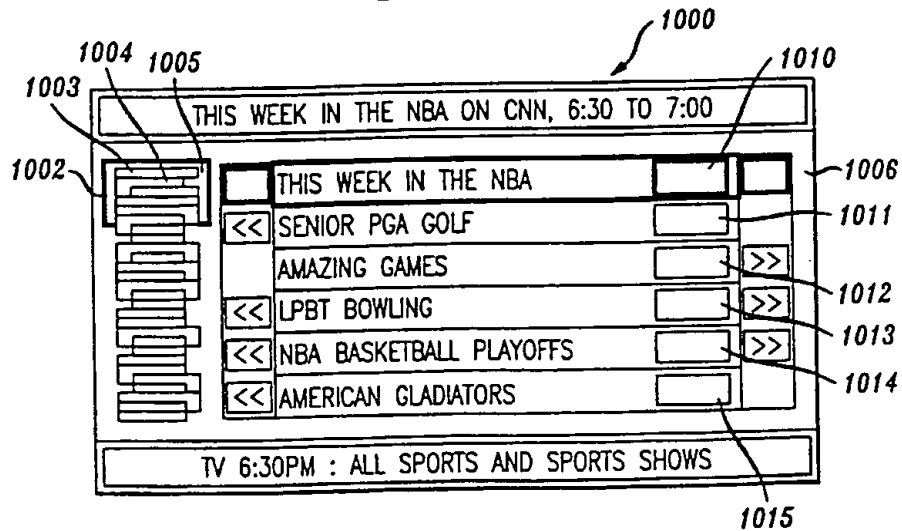


FIG. 11

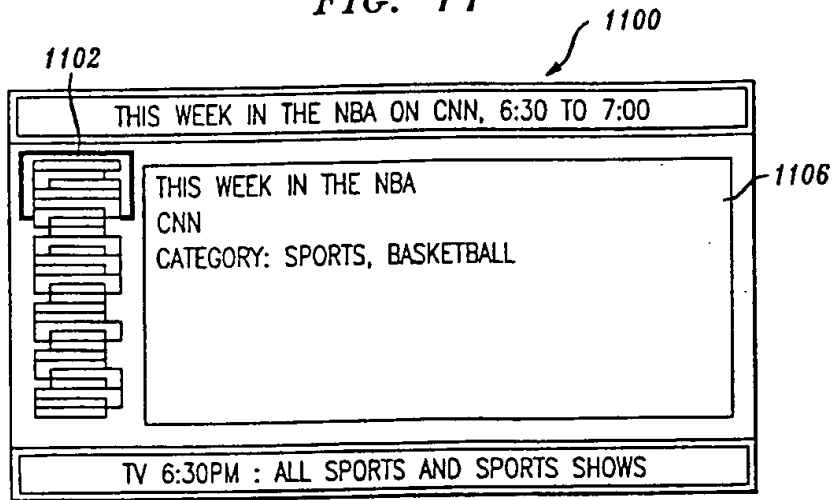


FIG. 12

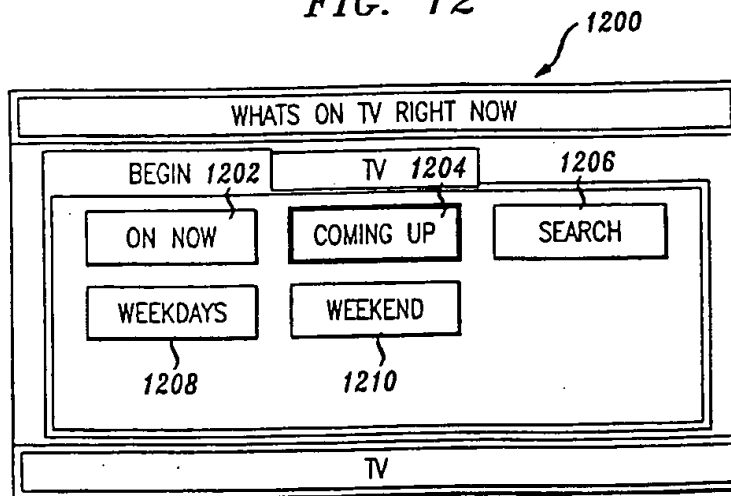


FIG. 13

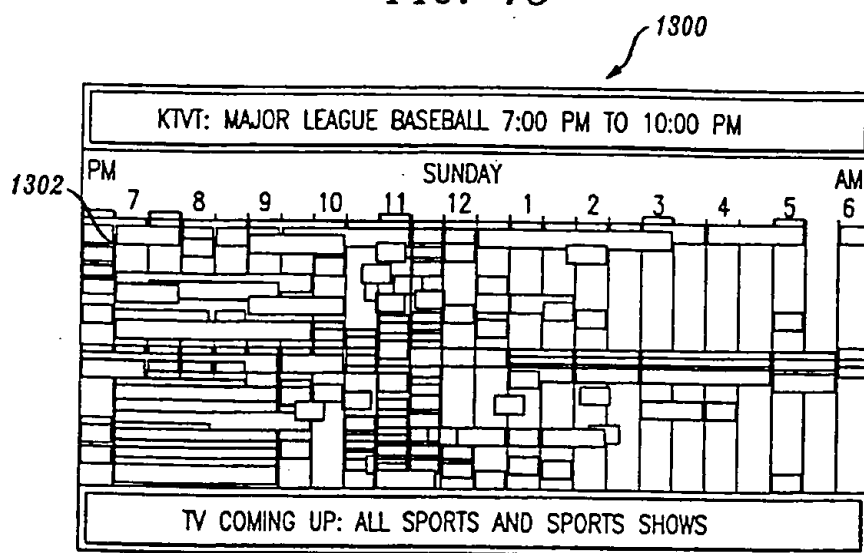


FIG. 14

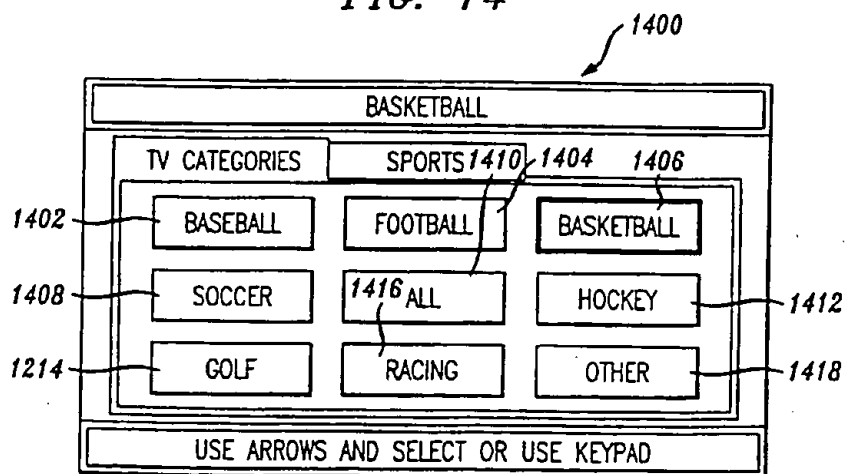


FIG. 15

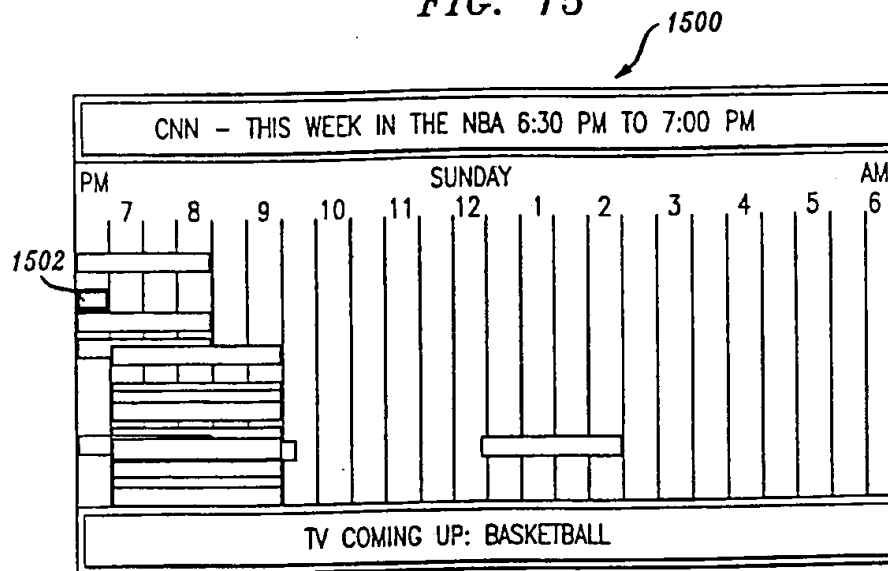


FIG. 16

1600

TITLES BEGINNING WITH 'SYMBOL OR NUMBER'

<input type="checkbox"/>	SYMBOL OR NUMBER	>>
<input type="checkbox"/>	A, B, C, D, E, F,	>>
<input type="checkbox"/>	G, H, I, J, K, L,	>>
<input type="checkbox"/>	M, N, O, P, Q, R,	>>
<input type="checkbox"/>	S, T, U, V, W, X,	>>
<input type="checkbox"/>	Y, Z	>>

TV. SEARCH

FIG. 17 1700

TITLES BEGINNING WITH 'M, N, O, P, Q, R'	
<input type="checkbox"/>	SYMBOL OR NUMBER >>
<input type="checkbox"/>	A, B, C, D, E, F, >>
<input type="checkbox"/>	G, H, I, J, K, L, >>
<input checked="" type="checkbox"/>	M, N, O, P, Q, R, >>
<input type="checkbox"/>	S, T, U, V, W, X, >>
<input type="checkbox"/>	Y, Z >>

TV. SEARCH

FIG. 18 1800

TITLES BEGINNING WITH 'M'	
<input checked="" type="checkbox"/>	M >>
<input type="checkbox"/>	N >>
<input type="checkbox"/>	O >>
<input type="checkbox"/>	P >>
<input type="checkbox"/>	Q >>
<input type="checkbox"/>	R >>

TV TITLES STARTING WITH M, N, O, P, Q, R

FIG. 19 1900

TITLES BEGINNING WITH 'N'	
<input type="checkbox"/>	M >>
<input checked="" type="checkbox"/>	N >>
<input type="checkbox"/>	O >>
<input type="checkbox"/>	P >>
<input type="checkbox"/>	Q >>
<input type="checkbox"/>	R >>

TV TITLES STARTING WITH M, N, O, P, Q, R

FIG. 20 2000

N.E. AUTO CLASSIFIED	
<input type="checkbox"/>	N.E. AUTO CLASSIFIEDS
	NLEC WORSHIP
	NNN NEWS MAGAZINE >>
	NO >>
	NYPD BLUES

TV TITLES STARTING WITH N

FIG. 21 2100

TITLES BEGINNING WITH 'NO'	
	N.E. AUTO CLASSIFIEDS
	NLEC WORSHIP
	NNN NEWS MAGAZINE >>
<input type="checkbox"/>	NO >>
	NYPD BLUES

TV TITLES STARTING WITH N

FIG. 22 2200

NOVA	
<input type="checkbox"/>	NOVA >>
	NOW GENERATION >>

TV TITLES STARTING WITH NO

FIG. 23

